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CONTENTS

Seasonal Sex Characters in Birds and Their Hormonal Control	By Emil Witschi	177-188
Nesting of the Raven in Virginia	By F. M. Jones	188-191
Observations on the Violet-Green Swallow	By A. E. Shirling	192-194
A Bird Census Method	By W. J. Breckenridge	195-197
Value of Field Observation in Economic Ornithology	By W. L. McAtee	198-204
Additional Iowa Species of Birds Substantiated by Specimens	By Philip A. DuMont	205-208
The Birds of Fort Sisseton, South Dakota, a Sixty Year Comparison	By Wm. Youngworth	209-235
General Notes		236-241
Editorial		242
Membership Roll		243-256

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THE WILSON BULLETIN

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SEASONAL SEX CHARACTERS IN BIRDS AND THEIR HORMONAL CONTROL*

BY EMIL WITSCHI

Considering the widespread interest in ornithological research, it is surprising, how little information we have concerning the causative factors controlling the conspicuous seasonal phenomena in bird life.

In the light of recent work on hormones, the seasonal changes obtain a renewed interest and I wish to present here, some of the results of experiments that I have carried out with the assistance of my students during the last three years.[1]

The first problem which we face is that of the *seasonal development of the gonads and the gonoducts.* During the sexually inactive period, the sex glands of most wild birds regress to tiny rudiments, resembling in every way, the corresponding organs in juvenile specimens. In the testis, at this time, one finds only inactive spermatagonia,

*This is a report on mostly unpublished results of investigations carried out with the aid of grants by the National Research Council, Committee for Research in Problems of Sex. Symposium Lecture delivered at the meeting of Section F, American Association for the Advancement of Science, Minneapolis, June 26, 1935.

[1]Hormones are substances produced in the glands of internal secretion. They are released into the blood stream and thus circulate in the whole body. However, they produce effects only in specially responsive, "tuned in" organs. These hormones can be prepared by extraction of the producing gland or they may be recovered from the blood serum. Some are eventually eliminated from the body through the kidneys and are therefore found in the urine. Three groups of hormones are considered in this paper. A. *Hormones of the hypophysis gland* which stimulate development of the gonads (so-called gonadotropic hormones, maturity hormones, or hebin). They are at least of two kinds, as becomes evident from the reaction that they produce in the rat ovary. A first type stimulates follicular growth while the second type produces corpora lutea (luteinizing hormone). B. *Hormones of the gonads* (or sex glands). The active ovary releases the "female sex hormone" or oestrin; the active testis releases the "male sex hormone". These sex hormones control the full development of many of the secondary sex characters. C. *The hormone of the thyroid* is very important for maintenance of body temperature and general life functions. In some way it has an influence also on feather growth and coloration. The function of the thyroid is controlled by the hypophysis (through the thyreotropic hormone). Hormones are highly potent substances. In most instances fractions of milligrams bring about the full reactions.

in the ovary only small ovocytes. At the approach of the breeding season, these glands enlarge very rapidly. The testis increases in weight 500 fold or more, while spermatogenesis proceeds quickly to the production of millions of ripe spermatozoa. Epididymis, vas deferens, and seminal glomus, the latter taking the rôle of true seminal vesicles, enlarge correspondingly and become filled with seminal fluid. In a similar way, though starting slightly later, develop the female genital organs. The ovary in the English Sparrow increases from less than 10 to 500 and more milligrams. The thin and straight oviduct becomes convoluted and very copious, due to the enormous development of its glandular endothelia.

The same developments can be evoked at any time of the year by injection of gonadotropic hormones (Figs. 15-18). The following Table I shows that any of the gonadotropic substances known to us can activate the quiescent bird gonad, though the reactions do not show a complete quantitative parallel to those in the rat. Equal

TABLE I

Effect of Gonadotropic Hormones on the Left Testis and the Ovary of the English Sparrow.

SOURCE OF HORMONE	DRU	l. TESTIS	OVARY
Beef Hyp. F.	1	x 8 C	x 1.5
Beef Hyp. F.	3	x 72 S	x 80
Beef Hyp. F.+L.	3+(3)	x 80 S	x 40 d
Beef Hyp. L.	(3)	x 30 S	x 30 D
Sheep Hyp. L.	(2)	x 20 S	---
Human P.U.	10	x 2 c	x 1
Human P.U.	20	x 15 C(s)	x 1
Human P.U.	50	---	x 1.5 D
F.+P.U.	.5+5	x 12 c	---
F.+P.U.	.5+10	x 18 C	---
Preg. Horse Serum	1	x 15 C(s)	x 2
Preg. Horse Serum	4	x120 S	x 4
Preg. Horse Serum	20	x150 S	x 40 Ov.
Preg. Horse Serum	40	x 80 S	x 60 D

C, spermatocytes (c, only in small numbers); d, slight degeneration; D, high degeneration; F, follicle stimulating fraction of hypophyseal extract; L, luteinizing fraction of hypophyseal extract; Ov., ovulation; P.U., pregnancy urine; (s), spermatozoa in small numbers; S, spermatozoa in large numbers; DRU, daily rat units.

amounts in rat units of follicle stimulating hormone from beef hypophysis and of pregnant horse serum act similarly on the sparrow testis, but very differently on the ovary which responds more strongly to the former. Hebin from human pregnancy urine brings about complete spermatogenesis, if excessive amounts are injected. The ovaries

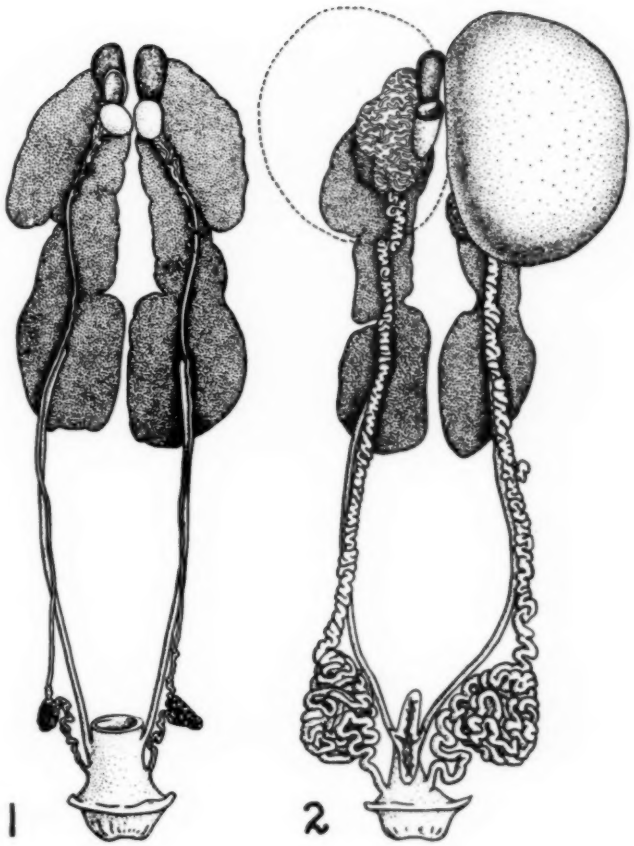

FIG. 15. 1, Urogenital organs of a male sparrow in the quiescent phase, x3. Weight of left testis, 0.5 mg., of left glomus, 0.4 mg. 2, Urogenital organs of a male sparrow in the period of sexual inactivity, after seventeen daily injections of 0.1 cc. (20 DRU) of pregnant mare serum; right testis removed to show the enlarged epididymis; x3. Weight of left testis, 345 mg., of left seminal glomus, 24 g. Note also the enlarged and convoluted vasa deferentia.

react but slightly and mainly by degenerative processes to the highest doses of urinary hebin. Purified luteinizer from beef and sheep hypophysis stimulates testicular as well as ovarial growth, though the latter soon ends in degeneration of the large ovocytes. *Summarizing*, we can say that in the bird, the quiescent gonads react most easily to hormones which in the rat produce follicle stimulation. Luteinizing hormones are less potent. However, they induce complete spermatogenesis if administered in sufficiently high doses. In the ovaries, they induce some developments which soon end in degeneration. In our finches, the most perfect results were obtained, by the injection of 0.1 cc. of pregnant mare serum. In the males, the testes and seminal ducts become filled with spermatozoa before the end of the second week (Figs. 16-17), while the females begin to ovulate and to lay normal eggs with colored shells (Figs. 18, 7). This result was obtained not only with the English Sparrow but also with African weaver finches (*Quelea quelea*) which otherwise never layed in captivity, not even during the breeding season.

These experiments indicate that the reproductive cycles of the birds are under hypophyseal control. It is known that this is true also for such mammals as the rat and man. The relationship is, however, a quite different one. In the rat, if the level of *sex hormones* (produced by testes and ovaries) falls, the hypophysis answers with the release of increased amounts of *gonadotropic hormones;* if the level rises, the hypophyseal output is lowered. In the finches, however, the hypophysis makes no attempt to keep the gonads and the sex hormones at a constant level. On the contrary, ebb and flood of sex and gonadotropic hormones are coincident and the hypophysis leads the gonadal development without reacting back on variations in sex hormones. We shall soon give further evidence in support of this statement. However, first let us consider the *factors that determine the seasonal cycles of hypophyseal activity.*

Popular opinion credits the rising temperatures in spring with the rôle of the first cause in bringing about bird migration, nesting, and breeding. Of course, the common citizen is highly impressed by the fact that in spring the coal bills become smaller and eventually fall off entirely. However, we must not forget that the migratory birds have spent the winter in tropical or subtropical countries and in fact move into cooler environments, at least during the time of actual migration. Rowan in his charming little book on "The Riddle of Migration" has conclusively ruled out the temperature factor. On the other hand, his experiments on the junco show that an artificial in-

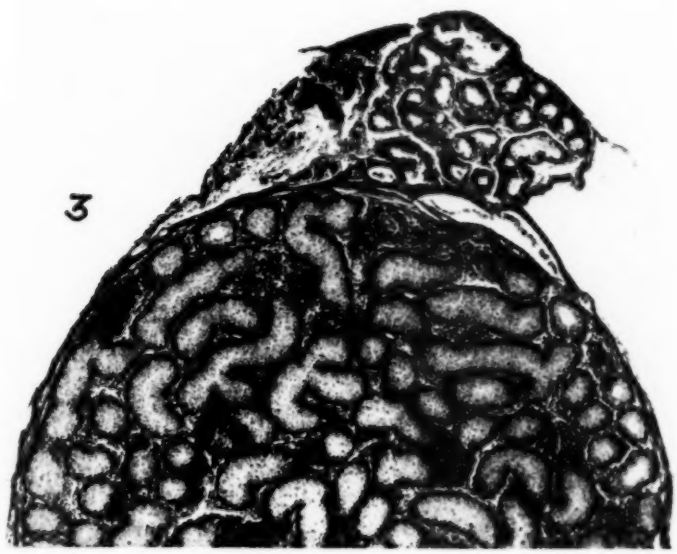

FIG. 16. Part of a cross section through testis and epididymis of a sparrow in the quiescent phase; x40.

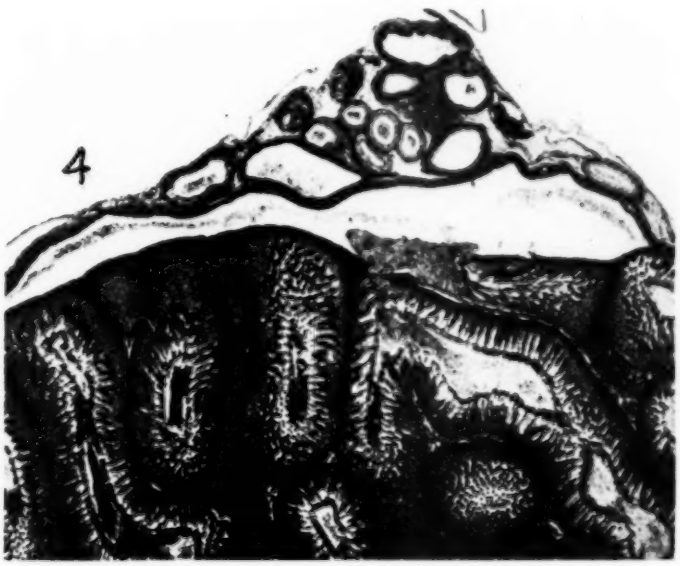

FIG. 17. Part of a cross section through testis and epididymis of the activated sparrow of Fig. 16; x40. Note the increased diameter of the seminal tubules, active spermatogenesis, and discharge of spermatozoa into the antrum of the epididymis.

crease in daylight beginning in November causes a development of testes and ovaries reaching the breeding size by January 9 instead of March, as under normal conditions. Miyazaki (1934) reports that in Japan, it is an old practice of owners of pet birds to induce singing early in winter by exposing the birds to candle light for three or four hours daily after sunset. This "Yogai" method is found especially effective in the White Eye (*Zosterops palpebrosa*). Bissonnette, working with the Starling, and Kirschbaum in experiments on the English Sparrow, find also that artificial lengthening of the day brings about a precocious development of the sex glands, especially in the male, during the winter months. We have ourselves repeated these experiments with similar effects. However, our observations seem to indicate, that the gonads respond only toward the approach of the normal breeding season and not in late summer nor in fall. It appears that the hypophyseal year cycle of the bird is as deeply rooted as the oestrus cycle of the human and other mammalian females. Changes in illumination may help to maintain the synchronism of the inborn cycle with the seasonal periods. We have observed that prolonged "Indian summers" with sunny days extending until late November bring about precocious developments of the testes in free living English Sparrows of Iowa. Yet the changing day in itself is not sufficient to explain entirely the breeding cycles, as becomes evident in the case of trans-equatorial migrants, like the Bobolink or the Golden Plover. Spending the winter south of the equator, they are exposed also to lengthening days; though their gonads remain quiescent. One should consider also that spring migration before the 21st of March takes the bird from longer to shorter days, as in the case of the Mourning Dove (Cole, 1933). Most interesting in this respect are possibly the tropical birds of which many have also very definite periodical breeding seasons. Different explanations have been proposed, most authors (Moreau, Bissonnette) agreeing, that changes in type or quantity of food most probably determine these cycles. This assumption, however, is definitely wrong. I have kept tropical African weaver finches for three years in the animal room at Iowa City, under constant food conditions and they have maintained their African cycles to this day. Oddly enough their breeding season is in the fall. If light has any influence, then this group of birds reacts to shortening and not to lengthening of the day. Even juvenile paradise whydahs which came into their first breeding period only after they had lived one full year in Iowa (and after having traveled through the shops of bird dealers in different parts of the northern hemisphere) unhesitat-

ingly fell in line with their adult companions, coming in breeding condition in August-September of their second year. According to Delacour and Edmond-Blanc, the breeding season of these birds in Africa is coincident with the rainy season. If light has any regulating effect, these birds obviously react to decrease rather than to increase of illumination. Experiments to test this question are in preparation.

It is an interesting fact that the hypophysis of the bird reacts at least in a limited extent to light, that is, to sensory stimulation. This case, however, stands not alone. Cole has shown in very convincing experimental series that the mere sight of the incubating female induces in the male pigeon the changes necessary for crop milk secretion. We must conclude, therefore, that a specific optic perception stimulates, in this case, the release by the hypophysis of the lactation hormone, prolactin. Furthermore, it is a known fact, again borne out by our own observations, that the sparrow female in the breeding season lays four or five eggs, and then becomes broody. Her ovaries during the incubating period regress rapidly through degeneration of the larger eggs. According to Riddle, this regression seems to be due also to the release of prolactin. If, however, one removes daily the egg that the sparrow deposits, she goes on laying up to fifty eggs in succession, often twelve to nineteen on directly consecutive days. Whether the female "counts" by eye or by tactile perceptions of the ventral body surface, is not clear in this case; though in a similar observation by Phillips on continuous egg laying in the flicker, the latter alternative has the greater probability. Somewhere, obviously there is a bridge between the nervous system and the hypophysis transmitting stimuli that direct the release, by the latter, of gonadotropic hormones.

From the consideration of gonadal cycles, let us turn to the *secondary sex characters*. We mentioned already that concomitant with the development of the sex glands goes the enlargement of the gonoducts. The castrate female has an oviduct as thin as that characteristic for the quiescent phase. Injections of daily doses of one to twenty rat units of oestrin bring about a rapid growth. With the maximum dose, the full breeding size is attained within one week. Similarly in the male, the epididymis and the vas deferens of castrates react on injections of male sex hormone. In the normal course of events, quite obviously, the hypophysis stimulates the gonads; and the growing gonads, by release of sex hormones, stimulate secondarily the gonoducts.

In many birds, the *color of the bill* changes during the breeding season. In the English Sparrow and some other finches, both sexes have a horn-brown bill during the quiescent phase. During the reproductive phase, this changes in males to a jet black. Castrates have permanently lightly colored bills, but injections of male sex hormone (extracted from male human urine) in minute quantities bring about the blackening of the bill in castrates as well as in males and females of the quiescent phase. On the contrary in the Red-bill Weaver, males and females have brilliantly red bills during the inactive phase, which turn to yellow during the breeding season in the female only. These bills change to yellow in either sex, or in castrates, at any season, upon the prolonged injection of female sex hormone (from female human urine). In the love birds, or parokeets, the sexes differ mainly in the waxy skin over the root of the bills. It is blue in the male and brown in the female, at least during the breeding season. Castrated males maintain the blue color which, however, changes to brown after injection of female sex hormone. Obviously, one of the alternate bill colors always is neutral, not hormone controlled, and persists in castrates and in both sexes during the quiescent phase. The other color, appearing during the breeding season only, is conditioned by sex hormones. Surprising is the fact that in some species it is the male sex hormone, in others, the female sex hormone that brings about the dimorphic effect.

The greatest puzzle was offered by the *plumage*. Instead of describing the zigzag course of our experiments, I shall try to describe in the most direct way the results that we have in hand now, at the end of three years of observation and investigation. Matters are relatively simple in the case of the English Sparrow. The plumage in this species is the simple expression of hereditary constitution. Castrated males and females maintain and repeatedly regenerate their inherited male or female plumage. Even if injected with hormones of the opposite sex or if implanted with contrary sex glands, they always regenerate according to the hereditary type (Keck '34). Sex hormones play no part in the determination of either sex type in plumage.

Things become more interesting in the case of the birds which put on a special breeding plumage in one sex. I mention the well known case of the Indigo Bunting. The female carries a modest brown habit throughout the year. The male, however, is iridescent blue nearly all over during the breeding season and brown with just a few traces of blue, if out of season. The bill of the female is always light brown, that of the male is brown out of season and daintily black and

FIG. 18. 5, Ovary and oviduct of a female sparrow in the quiescent phase; x2. Weight of ovary, 10 mg. 6, Ovary and oviduct of a female sparrow in the period of sexual inactivity, after sixteen daily injections of two rat units (2DRU) of hypophyseal extract; x2. Weight of ovary about 500 mg. 7, Ovary and oviduct of a female sparrow after seventeen daily injections of 0.1 cc. (20DRU) of pregnant mare serum; x1. Weight of ovary, 940 mg. A window is cut into the uterine part of the oviduct to show the enclosed egg with its normal shell.

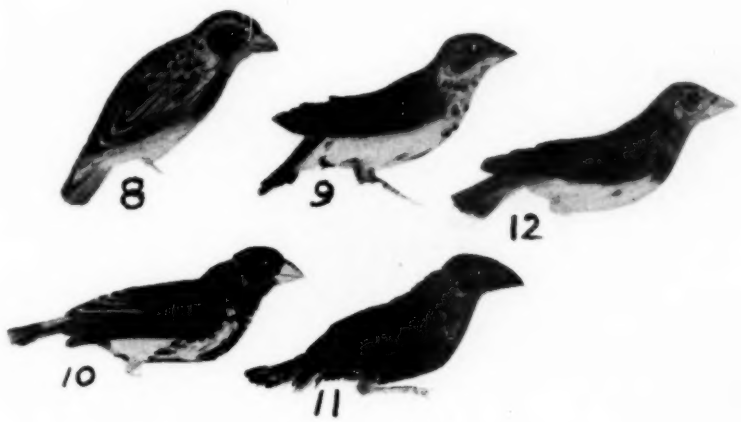

FIG. 19. Color phases of the African weaver finch, Pyromelana (Euplectes) orix franciscana. 8, Henny plumage, carried by females all year round and by males outside of the breeding season (January-May); the bill is ivory colored. 9, 10, Molt of the male and assumption of the cock's plumage (June-August) at the approach of the breeding season; the bill purple, changing to black. 11, Fully developed cock's plumage carried during the breeding season (August-October); the bill is black. 12, Castrated male outside of breeding season which, exceptionally, carries an intermediate type of plumage; the bill is ivory.

white during the breeding season. Castrated females so far have not exhibited any changes. Castrated males show a light brown bill throughout the year, indicating that no sex hormones are produced any longer. But to our great surprise, castrated males go on changing from brown to blue plumage and vice versa in the same rhythm as their normal male cage companions.

African weaver finches show similar phenomena. For experimental purposes they prove more valuable, because they are more hardy in captivity. At least in the case of the orange weaver, we know that the male passes through two molts, the female through one only. Probably the same condition prevails in the whole group of weaver finches. Both sexes molt at the end of the breeding season and acquire the modest henny plumage. At the beginning of the breeding season the male sheds this sober garment and dons a flashy nuptial plumage of black, and orange-red. The new pattern does not show any regard for the design of the cast off henny plumage but runs across feather tracks and natural boundary lines. At the same time, the bill of the male changes from ivory to black (Fig. 19). Castrated males permanently assume or maintain the light colored bill indicating absence of male sex hormone; though they go on changing, rhythmically, their plumages. It is interesting, however, that a few castrated males do not acquire a completely henny plumage during the inter-season, but a plumage with a mixture of nuptial and henny characters (Fig. 19, 12). The cock's plumage of the breeding season is always perfect. Females as mentioned above, do not change their modest garb at the beginning of the breeding season. Female castrates observe the same economy and even plucked feathers regenerate only rarely. However, the few that do so are of the cock's type. They are always shed at the end of the season, when a new henny plumage is acquired.

These observations suggested on the one side that the plumage type is controlled by hormones; on the other hand it was obvious that sex hormones are not the ones concerned. Consequently we suspected that the plumage type might be directly controlled by the hypophysis. We were, however, only recently able to prove our point, when we injected some of our birds with pregnant mare serum, containing that powerful gonadotropic principle. Injected at the daily dosage of 1/10 cc. of serum into normal and castrated male and female weaver finches out of the breeding season, it induced regeneration of cock's (in place of henny) plumage in all but the normal females. In the latter the change of the bill color from red to yellow (in red bill

weavers) and the rapid development of the genital organs with subsequent egg laying, clearly indicated the presence of female sex hormone (produced by the enlarging ovaries). Injection of female sex hormone into males in breeding season has always a feminizing effect on the plumage. We can conclude, therefore, from our experiments that: (1) the henny plumage of weaver finches is the neutral (not hormone conditioned) type; it is found, consequently, in both sexes and in castrates, out of season. (2) The cock's plumage is due to a high level in gonadotropic hormones. (3) Female sex hormone counteracts the "masculinizing" effect of gonadotropic hormone on the plumage. These investigations show further, (4) that castration in birds stimulates only slightly, if at all, the hypophyseal activity, and (5) that the hypophyseal seasonal cycles are wholly independent of progressive or regressive changes in the sex glands.

There is just one more point which I wish to bring out. I remarked above, that success in our work on the plumage came with the application of pregnant mare serum. Before that, we had used other gonadotropic substances, especially extracts from beef hypophysis. These gave nearly as good gonadal development in normal males and females, but the plumage reaction was of the henny type in both sexes and also in castrates. The solution of this riddle came through the examination of the whole endocrine system, which showed that the extracts brought about an enormous enlargement and an apparent rapid discharge of the *thyroids*. The thyroid hormones, however, have a very decided "feminizing" effect on the bird plumage. This has been suggested already by earlier work of Cole and others on the chick, and is brought out again by extensive studies by one of my students on the plumage of the sparrow (Miller '35). It is especially interesting that in the sparrow, where male and female sex hormones show not the least effect on the plumage, injections of thyroxin change the developing feather from the male to the female type.

The most remarkable fact brought out by these investigations on seasonal sex dimorphic plumages is their dependence on other than sex hormones. Whether the sex difference in molting periods, which is also maintained after castration, is under hypophyseal or possibly, under genetical control, we do not know at the present time. Miyazaki's experiments seem to indicate that shortening of day length causes molting in the White Eye.

If time would permit, a discussion of the different mechanisms of determination of plumage patterns should follow this presentation of mere experimental data. In concluding, may I again emphasize the

here established fact that even within the taxonomic family of the finches, the sex type of the plumage is determined in one species (sparrow) directly by the genetical constitution of the feather forming cells, and in another species (orange weaver) through free circulating hormones in the blood stream. It might well be that, through the closer study of such cases of substitution of hormonic by direct genetical control, we shall be able to learn more about the physiological nature and the mode of action of the hereditary element, the mysterious gene.

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NESTING OF THE RAVEN IN VIRGINIA

BY F. M. JONES

Dark shadows were forming in the deep hollows leading down from the Shenandoah Mountains. The sun had already passed out of sight on the other side, and now twilight prevailed. Silence reigned everywhere over a snow-clad landscape which appeared to be devoid of life.

High up on the side of the mountain perched on an old dead snag leaning over a steep rock cliff sat a Raven in owl-like posture, seemingly in deep thought. Perhaps he was dreaming of bygone days when his kind inhabited all of the eastern mountain ranges in a land of plenty where game of all kinds was abundant and food easily procured. What now? Gone forever were the millions of Passenger Pigeons whose flight at times darkened the skies. The bugling of the elk was no longer heard. The land of abundance and plenty had van-

ished, and of the multitudes only a few remnants could now be found to mark their passing.

First came the large band-saw mills which were supplied with timber by the logging trains that penetrated even to the remotest sections of the mountains. Soon afterwards all of the best of the big trees had been cut down, and now followed devastating forest fires which destroyed everything in their path and the once enchanted fairyland formed by nature was converted into a desolate waste.

Of a wild nature which craves freedom and seclusion the Ravens could not cross the barriers erected by civilization, and with all of their range and food supply destroyed there was nothing left for them but starvation, and starve they did. Still the older generation of the mountain folks often ask me, "What has become of the Ravens?" They do not take in consideration what had gone before, nor the part they played in the passing of the Ravens when they periodically set fires to the mountains to make huckleberry picking easier and more profitable. Such futile questions were better left unanswered.

No wonder this pitiful remnant of the multitudes seemed to be in deep thought, for he was no doubt going supperless to roost, as he had done many times before. This was one of a pair which had a nest in the cliffs below the dead snag, and to which they returned each day before nightfall—for the Ravens' nest is their home. Nearly always, too, they are seen in pairs, and it has been said by many naturalists that they remain mated for life. My limited knowledge of them tends to confirm this belief also, for one of my favorite pairs of Ravens, which I have known for fourteen years, have remained together during that time. They are not to be mistaken for any others which overlap their range, for both have voices which are quite distinctive. One has a mellow call-note somewhat similar in tone to that of the Canada Goose, and it is never without a thrill that I mark the passing of this bird high overhead on slowly beating wings, flying to the high cliffs overlooking the wide spaces below.

It is now early March and nesting time somewhat delayed by many snows and unusually cold weather, was close at hand. During the previous month the nesting shelf had been swept clean of all of the old nest material, and was ready for the new one that was to occupy the same place. Contrary to general belief and the stories which have been written about their nesting, no part of the old nest is ever used.

Soon afterwards both birds could be seen around their nesting cliffs, most any time during the day, working on their new nest or

sitting on the rocks or old snag above. From a vantage point about a mile away I could daily watch their activities through my binoculars; and they would no doubt have been much disturbed had they known how often I was spying on them. When one bird would fly to the nest on the rocks the other would perch above, and at intervals would sail from the cliffs to see that no intruder approached unobserved. Once when I saw them both leave together I went up to their cliff and inspected the nest from below, but, not wishing them to find me there on their return, I did not tarry long.

A few hundred feet down from the Ravens' nest a pair of Duck Hawks had appropriated an old nest formerly used by Ravens and were on constant guard duty there. While it is at times possible to visit Ravens' nests unobserved by them, there is not a chance of reaching the nest of these falcons unseen by one or both of them. Starting down the mountain I was soon greeted by the cries of the male Duck Hawk which immediately attracted the attention of the other. Now I had both flying over me, protesting the invasion in no uncertain terms, and the fuss they made soon brought both Ravens to see what was causing the disturbance. Looking into the hawks' nest from an adjoining chimney rock and seeing that as yet there were no eggs, I went on back and over the top of the mountain. All the way up I was escorted by one of the Ravens soaring in circles overhead. After reaching the top the male Duck Hawk seemed to get tired of the fuss the Raven was making and drove him back down under the mountain. After the first swoop of the hawk, the Raven lost further interest in me and left in undignified haste, knowing well that this was no time to hesitate if he wished to escape with a whole skin.

During the latter part of March only one Raven was seen over the cliffs, so now the full set of eggs had been laid and the female was on the nest engaged in the labor of hatching out the young ones. Going up to investigate I was met by the alert male bird on watch, who continued to circle around me until I got close to the nest when he flew directly past the nest to warn his mate of approaching danger. This she disregarded, for it was not until I was within fifteen feet of the nest above that she left and flew overhead so close that she appeared to be twice as large as she really was. Not often is an opportunity afforded of seeing a Raven so close, for they are the wildest of all birds; and even in going from one mountain range to another their flight is always high out of danger from below.

Their selection for a nesting site was a high cliff from which the whole of the surrounding country could be viewed. The nest was on a small shelf back in a pocket of the rocks and under the steep overhanging rocks above, which made it inaccessible from that point—this being the usual situation. Reaching the nest by going up from the bottom of the cliffs, I found it to contain five eggs, which was the average number found in those Ravens' nests I had examined. The nest was nicely and compactly made of small sticks with fine black birch twigs and roots on the inner side next to the lining; the latter was composed of very finely shredded inner chestnut-tree bark with a small amount of sheep's wool intermingled. Ordinarily wool is one of the principal materials used by them for their nest linings, but as this particular mountain section was not used for sheep-grazing, wool was hard for them to obtain, except in the cultivated areas where the Ravens would not venture. Beneath the thick lining I found two inches of soil, which was also used in all of the four other nests examined in this range during the nesting season of 1934. Nests found in previous years 250 miles farther south were lined with equal parts of usnea moss and wool, with no earth used beneath the lining. Just why the difference in construction of the nests in various localities I am unable to say, unless the combination of moss and wool forms a sufficient insulation for the thin-shelled eggs which is lacking in the lining made of the inner bark. It is to be remembered that when the eggs are laid the cliffs are still covered with ice and the weather is far from being spring-like.

This nest, like all the other Ravens' nests which I have found, was smoothly finished on the inside and deeply cupped, almost like an inverted cone. It measured twenty-three by thirty-six inches outside diameter, while the cavity was twelve inches in diameter and five inches deep. Where it was situated no rain nor sunshine could ever penetrate, and this location, used by many generations of Ravens, had a large accumulation of materials below which had composed the old nests. It was one of the few places left which was not likely to be disturbed by unwelcome visitors and the presence of mankind.

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OBSERVATIONS ON THE VIOLET-GREEN SWALLOW

BY A. E. SHIRLING

Talk about housing problems! Boom towns in gold rush times had no greater shelter problems than is the shortage of nesting cavities among Violet-green Swallows in the western mountain regions.

The Violet-green Swallow (*Tachycineta thalassina lepida*) is to the Colorado mountains what the English Sparrow is to eastern and central states. It is the most common bird about cottages and towns. In respect to relative abundance, it exceeds the English Sparrow, for the sparrow's range is confined to human surroundings of houses, barns, and picnic grounds. The Violet-green Swallow, while most abundant in the neighborhood of human dwellings, ranges widely up the mountain slopes and unfrequented forest lands.

The Violet-green Swallow has a great advantage over the English Sparrow from the point of beauty and popularity. It is a most beautiful bird in color, in trimness of shape, and in gracefulness of flight. It is pure white beneath and iridescently violet and green above, with violet rump, dark green back, and black wings. With its long tapering wings it is tireless in flight, and its aerial acrobatic movements are performed with astonishing ease and grace as it collects insect food from the air.

This swallow is not a pugnacious bird, but somehow it manages by quiet, persistent insistence to attain its end and to succeed in the struggle for existence, somewhat to the detriment of other species. So well has it succeeded, that the most trying phase of its struggle for existence among the cottages is with members of its own species rather than with other kinds of birds and enemies. More specifically, it is a struggle for nesting sites.

Violet-green Swallows nest in cavities. In olden times deserted woodpecker burrows in trees furnished most of the nesting places, but with man's advent bringing buildings, artificial bird houses, and various types of knot-hole cavities, the birds are capitalizing on these. So keen is the struggle for nesting places that there is not only a waiting line, but apparently more than one pair of birds are concerned with one nest.

We were watching a nest one day, keeping tab on the number of feeding visits of the parent birds to their young in the nest. It soon became clear that more adult birds were coming to the nest than bird-housing ordinances allow. One female swallow came with food, entered the nest and before she had gone another came, perched on the stub of a branch sticking out from the hollow nesting log and tried

to enter by way of a knot hole that was too small. Then as the first female left, the second one entered the nest, remained for a few seconds and left. (At close range and in good light sexes could be quite readily distinguished by the duller colors and grayish cheek of the female). This performance was repeated several times within an hour, one female persistently trying first to enter by way of the small knothole, then, failing, would enter by way of the larger opening. The other female went directly to the real entrance. One male bird stood guard and rarely entered the nest. He was kept busy chasing other male swallows away, but did not seem to object to either of the females coming.

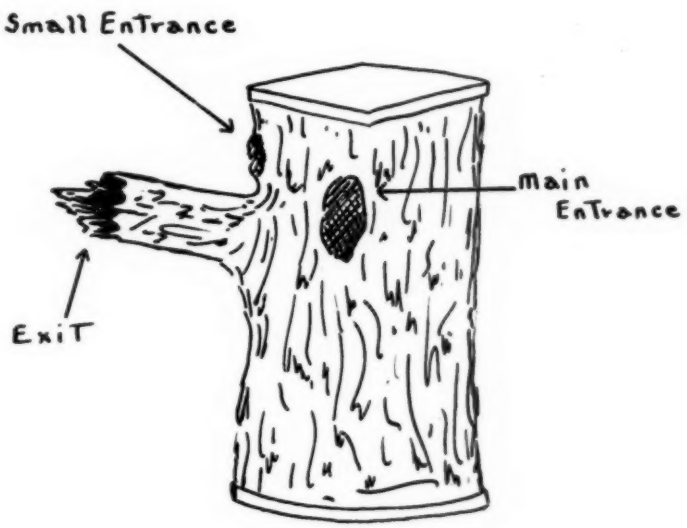

Fig. 20. Nesting box of the Violet-green Swallows.

This performance of more than one female swallow visiting the same nest was not a coincidence, nor the only instance of unusual nesting behavior of the Violet-green Swallows. After our suspicions and curiosity were aroused, we gave special attention to the birds in order to verify our first observations.

Another nest, built in a bird house made from a twisted hollow limb fastened to a pine tree near my window, could be most conveniently observed. Here, too, there was more than one female swallow interested in the nest. At one time three female birds and one male were at the nest. The male, keeping guard, paid little attention

to the other birds unless it was a bird of some other species that arrived, or a male Violet-green Swallow. A female swallow, which may be termed No. 1, entered the nest to feed the young. Another came and lit on a branch near by, then fluttered at the entrance to the nest but did not enter. Bird No. 1 left and at the same time bird No. 3 arrived and entered the nest, remained a few seconds, flew out, and perched on the branch near bird No. 2 and the male. Bird No. 1 came back after a few minutes, chased Nos. 2 and 3 away and entered the nest. At other times one of the extra females would peck at the male guard and try to drive him away without any retaliation on his part.

Female No. 1 seemed to have priority of claim to the nest. She often remained with her head at the doorway and pecked at intruders. She was also on very good terms with the male. The other female birds seemed to be merely meddlesome busybodies who had no home of their own nor young to care for, and, like a cat that has lost her kittens, just had to have some one to mother.

Mountain Bluebirds have some slight advantage over the Violet-green Swallows in securing nesting places. They arrive earlier in the season and have begun housekeeping before the swallows arrive. Even so, they have to keep close guard or their nest will be taken.

A bluebird built in a nesting box under the eaves of the lodge at Camp Olympus, Estes Park. When the swallows arrived they tried to take the place but were warded off by the vigilant male bluebird. A pair of swallows then began a patient endurance waiting game. They remained at hand constantly. If opportunity were given they would perch at the doorway and peek in. This was especially noticeable when the young bluebirds grew older and were about ready to leave the nest. Finally, when they did leave, that very day the Violet-green Swallows entered and took possession.

Violet-green Swallows are near kin to Tree Swallows that inhabit northern portions of the United States and Canada and, during migration, travel across the central portions of the country. Other relatives are Cliff or Eave Swallows that build "clay jug" nests under projecting cliffs or under eaves of buildings, and Barn Swallows that have "swallow tails", and build open cup-shaped nests of clay plastered on rafters and beams inside of barns. Still other kin are Rough-winged Swallows and Bank Swallows that tunnel into cliffs of earth. These latter, as well as the Cliff Swallows, prefer to live in colonies. Sometimes hundreds of nests are found in the same cliff.

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A BIRD CENSUS METHOD

BY W. J. BRECKENRIDGE

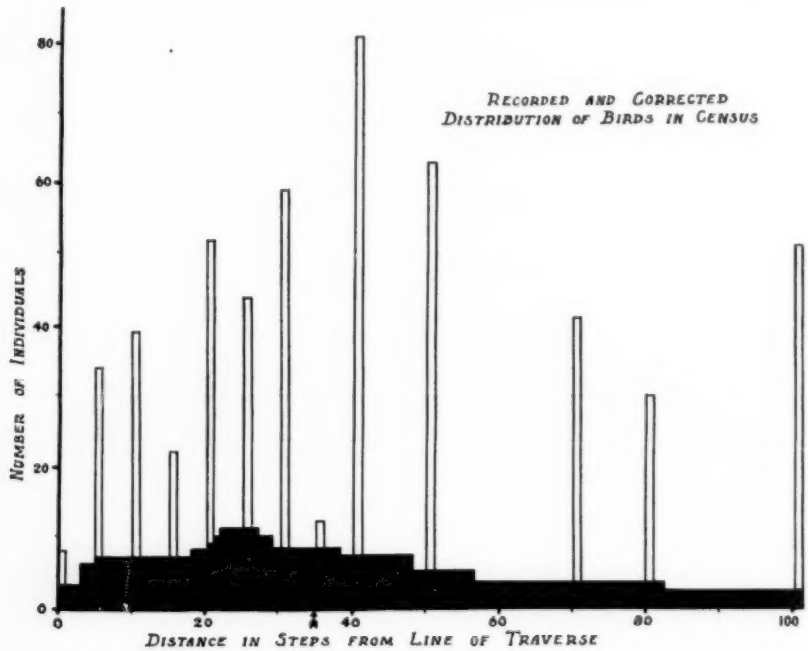
During the course of an ecological study of the Marsh Wrens in a limited area in eastern Minnesota, the writer found it desirable to ascertain something regarding the populations of other birds breeding on the same area. Numerous census methods have been described by other workers. Most of these have been devised to indicate relative densities of populations for different areas or periods and were not applicable to the present study. Others have attempted to determine actual populations of limited areas, but their methods, while workable perhaps for very small tracts, could not be applied successfully to areas of a square mile in extent, the size of the tract in the present study.

The square mile on which this census was taken lay in very slightly rolling country. The ridges were covered by a sparse timber growth, the depressions were grown up to sedges and bluegrass, while the narrow belt between these two supported short willow and dogwood brush. These vegetative types appeared in irregular, narrow strips or isolated patches so intermingled as to be impossible of separate study in regard to avian populations. The following paragraphs describe the method used in this mixed type of vegetative cover and include some results from this particular census.

The observer (the writer worked alone in this study) traversing the section along compass lines, identified each individual bird, as far as was possible, as it was encountered and recorded the species and the approximate distance in steps (2,000 of the writer's equaled one mile) from the compass line from which it was seen. The section was thus crossed four times along parallel lines separated from each other by at least three hundred and fifty steps. This avoided the possibility of counting the same individuals twice. By following compass lines the observer avoided favoring or neglecting any one type of cover. These traverses were made during the morning and evening hours when the birds were most active. In the present study one census was made along north-south lines while a checking census was made along east-west lines a week later.

The securing of the total population was the primary object in the present study. In order to obtain this, the total number of birds flushed at each of the indicated distances from the compass line was determined and plotted as one of the open bars in the accompanying figure. It was assumed that some error occurred in estimating these distances. For those recorded as flushed at ten steps, for instance, the

actual distance probably varied between seven and thirteen steps, and for those recorded at forty steps the distance varied perhaps from thirty-two to forty-eight steps. Accordingly these errors were corrected by distributing the records over those ranges and the result, appearing in the figure as the shaded portion, presented a fairly accurate picture of the actual distribution of the birds flushed. From this picture it appears that few birds were flushed directly on the line and that the number increased as the distance from the line increased



up to twenty-five steps where they dropped again to a level and then began to show a definite decrease between thirty-five and forty steps. The explanation for this was that a portion of the birds occurring on the line of traverse moved outward in the vegetation and appeared a short distance on either side of the line. Then, allowing for this movement, it is seen that the maximum flushing per step from the line occurred equally out to about thirty-seven steps where a decrease began. Therefore one may safely assume that *at least* the number of birds flushed within the thirty-five step line (two hundred and seventy in this case) would be encountered on every strip seventy steps wide (thirty-five on either side of the line) and four miles long throughout the section. On this basis the *minimum* population for this particular

mile proved to have been 1,929 birds or 3.01 birds per acre. This would necessarily be somewhat under the actual number present as one man crossing the area would not record every individual bird on a strip seventy steps wide. A number of individuals walking close together might materially reduce the error from this source. Strangely enough, due to the above mentioned outward movement of the birds before flushing, calculations based on those seen on a very narrow strip, e. g., twenty steps in this case, produced a smaller total than those using the wider strip. No way of determining just what percentage of the actual population these figures represent is known, therefore the results arrived at in the above manner must be taken as *minimum* populations.

Information regarding the actual and relative abundance of the more common species was also secured from the above mentioned data. Figures similar to the one constructed for the total population were drawn up for the more abundant species separately. Here the same scarcity of records on the line with an increase outward was evident. A limit was set in each case beyond which the records began to definitely decrease. The number of birds was determined within this limit and from this the species totals for the square mile were calculated. In the case of those species other than the very abundant ones where comparatively few individuals were encountered on four miles of traverse, numbers thus calculated would usually be rather inaccurate. Accordingly the results thus arrived at in this case were considered comparatively dependable only for the five most abundant out of the sixty-seven species found nesting on the tract. The totals for these five species follow:

1. Clay-colored Sparrow 540
2. Song Sparrow 227
3. Yellow Warbler 212
4. Catbird 143
5. Northern Yellowthroat 140

This method of determining actual bird populations, like all other methods, is open to criticism at various points. However, it is here presented as being considerably more accurate than mere estimates would be, and as producing numerical results which may be depended upon not to be in excess of the actual populations but which are in all probability a small percentage under the actual numbers of birds present on any areas so studied.

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VALUE OF FIELD OBSERVATION IN ECONOMIC ORNITHOLOGY

BY W. L. MCATEE

In the WILSON BULLETIN for June, 1934 (Vol. 46, No. 2, pp. 73-90) is an article by E. R. Kalmbach entitled "Field Observation in Economic Ornithology."

Mr. Kalmbach is careful to say that he does not wish "to discredit in the least stomach examination as a fundamental procedure in the solution of problems in economic ornithology" (p. 74), but considering the superficiality of most reading and the proneness of humans to see in a thing what they wish to see, it is, after all, not surprising that some have jumped to the conclusion that the method of stomach analysis has been authoritatively pronounced obsolete.

It may be well, therefore, to cite from Kalmbach's paper phrases additional to that just quoted, that show he had no such intention. He says, "there must be no slackening in laboratory research" (p. 80). "Let it not be inferred, however, that stomach examination . . . does not play a most important, yes, indispensable rôle in our science . . . certain of the practical problems of economic ornithology lend themselves to direct solution solely or largely through this method of approach" (p. 80). "In this capacity, the laboratory channel of approach never will be excelled. Stomach analyses of extensive and representative material is the only means, furthermore, of creating a background for proper appraisal of the general economic status of birds, something that is needed as a check upon every local or specific [i. e. field] study" (p. 81). "It is a truism . . . that stomach examination, carefully conducted, gives the best possible index to the food items of a bird" (p. 88).

The writer hopes that this grouping of Kalmbach's references to the method of stomach analysis may be the proper corrective for those who thought they saw, in his essay, something to quite the contrary effect. Kalmbach certainly did not mean to condemn the method of stomach analysis for it is the principal reliance in researches he is now conducting and directing in one of which, for example, on the food habits of the armadillo, little progress could be made in any other way.

To bring out both sides of the argument and to combat the impression the paper has made that stomach analysis is obsolete, the following comment is offered: The method of stomach examination "has acquired, in both the scientific and lay mind, a status of finality shared by no other method of approach" (p. 74). Apparently it needs saying that there is no such thing as finality in any field of

knowledge. Least of all should the scientist admit that term to his vocabulary. In science all questions are forever open.

"Limitations in this well-established procedure" [stomach analysis] (p. 74). Every method of studying the food-habits of wild life has its limitations—they are not peculiar to laboratory work on the contents of the alimentary tract. We should avail ourselves of all methods, thus taking advantage of any special excellence each may have and profiting by any mutually corrective principles that may appear.

"Knowledge of field conditions and the circumstances surrounding the collecting of stomach material is the key to proper interpretation of food items" (p. 75). If that knowledge could be full and accurate this statement might be acceptable, but as a matter of actual experience we do not often get either full or accurate knowledge of the doings of any wild thing in the field. It is a commonplace of laboratory procedure to find that the collector's remarks on what a bird was apparently eating are not verified by analysis of the stomach contents. Not only is it difficult to make observations in the field that will be very helpful in connection with the study of individual stomach contents, but if we attempted to adopt a policy of having "the examiner of bird stomachs personally . . . collect every specimen which he later examines" (p. 75), meanwhile getting accurate "knowledge of field conditions and the circumstances surrounding the collecting" (p. 75), comprehensive investigations would be impossible. The proposal would be merely one more of those ideal conceptions that can not be accomplished in reality. What we have needed and still need in the case of certain groups of birds never reported upon is comprehensive information regardless of shortcomings as to detail that will give us a general idea as to food-habits over a wide range, perhaps the whole United States, at all seasons. We can get some sort of approximation to that knowledge by the analysis of a large number of stomach contents, well distributed both seasonally and geographically, but we can not get it by intensive field study simply because of the impracticability of allotting for the purpose, the time, the men, and the funds that would be necessary.

The field method of studying economic ornithology can not be our main reliance, not only by reason of impracticability, but also because it cannot be as comprehensive as the laboratory method, nor does it have as high a degree of accuracy. In this as in all sciences what we learn in the laboratory is the most exact and reliable part

of our knowledge. What we learn in the field is more tentative and usually in need of some process of checking or verification.

Even in studies where every effort is made to obtain in the field an accurate idea of what a bird is feeding upon, the results are far from satisfactory when checked with those derived from the analysis of stomach contents. For example, to facilitate laboratory study of a large series of stomachs of Gambel's Quail from Arizona, D. M. Gorsuch supplied notes on what he had come to regard as important foods of the species as a result of field observations. When work on the stomachs (178 in number) was completed, it was found that of foods considered important by the field observer and so recorded in his notes or in his recent report on the bird (Univ. Ariz. Bull., Vol. V, No. 4, May, 1934) six had that rank in the laboratory findings and five did not. The use of five unimportant items also was verified. Of foods not noted at all by the field observer seven were found of considerable, and eighteen of lesser, importance in the laboratory. In other words the field observer's results were verified in eleven cases (five of them unimportant) and not in five, while those results did not include at all seven items of primary, and eighteen of secondary, importance in the diet of the quail. This gives an efficiency rating of 27 per cent for the field observations, and that without taking into account some scores of minor items revealed by stomach analysis but which could not be learned at all by field study.

"Correct interpretation easily may be a matter of greater significance than the identification of the item itself" (p. 76). It should not be overlooked, however, that interpretation can not begin until the identification is made. Interpretation may be aided by field observation but it can safely be said that accurate identification of food items can be obtained in the vast majority of cases only by laboratory procedure. Without identification there is not even a beginning of knowledge.

"Correct interpretation" again, so far as applied to the intricate subject of wild life economics, denotes an ideal often unrealized. This science is peculiarly one of approximations and it can not be expected that interpretations will be of better quality than the data on which they are based. Thirdly, let it be remembered always that "interpretation" is a necessary adjunct to wild life food habit studies of whatever type. In other words, if we are wise we will bring to bear on each problem all of the information we can obtain from every source—with due credit to all and without undue disparagement of any.

English Sparrows consuming insects attracted to city arc lights "may suddenly assume the prosaic rôle of a scavenger of doubtful

utility" (p. 79). There is no doubt as to the utility, only as to its degree.

"Modern decisions" (p. 79). If the term "decision" is used in the ordinary sense of settling or terminating discussion of a given matter, it is another of the too positive expressions used in this discourse. See remarks under "finality", (p. 74). There are no such things as final decisions in wild life economics. Problems are often not only local but they may be very temporary. A "decision" may be no more than uttered before the situation changes. As applied to food habit studies, these things emphasize the necessity of generalizations from a satisfactory number of stomach analyses since the local and shifting field conditions in themselves can not be so summarized. Field problems are local and temporary and corresponding valuation is about all we can give to observations, interpretations, or decisions about them.

"General tendencies for good or harm can be shown" (p. 88). This is about all that can be expected from economic studies whenever they cease to be strictly local. It is not the function of general food habit studies to attempt to show in concrete terms how much good or harm is being done. The science, as remarked before, can only be one of approximations, hence its output should not be represented as more than statements of economic tendencies.

"The effect of feeding habits . . . in the final analysis, is the actual goal in many modern problems of economic ornithology" (p. 88). This has a matter-of-course sound but in reality the goal mentioned is attained only locally and then in case damage to a crop or other measurable thing is involved. The effect of feeding habits on unmeasurable things as natural populations of weeds, insects, etc., can hardly be referred to as a goal because in most cases it is unattainable.

"Determination of the economic status of a bird" (p. 88). There is no such thing as "determination" if that meant establishing an economic status that will have final and universal validity. It is possible to arrive at good summaries of average food habits which are the best guide we can have as to the general treatment of species. This is the basis ordinarily needed for legislation and regulation. It has been furnished by stomach analyses and is something we could never attain as a result of field studies on account of the very size and complexity of the problem.

"Economic status and food habits are, by reason of their fundamental aspects and definitions, antithetic" (p. 88). If the proposition were true, as stated, we would hardly base our studies of economic status chiefly on food habits. In the same paragraph Kalmbach admits

that the study of food habits reveals sustenance. Since choice of sustenance and its effects are what mold our opinions as to economic status, it would seem difficult to defend the antithesis.

"Primarily the objective in our problems is one of economics; yet the product of much research into the economy of birds is purely biological" (p. 88). Sufficient rebuttal to this pronouncement is that the science of economic biology fuses the two, in actuality, as well as in name.

Continuing directly from the preceding quotation, "This product, the result of painstaking stomach examination, often is looked upon as the end sought or, if not actually the goal itself, so close an approach to it that the intervening gap is but a step in a simple process of deduction. Therein lies a fallacy that has served as the theme of much of this paper" (pp. 88-89).

Has that fallacy in fact existed?

In 1880 S. A. Forbes the founder of scientific economic ornithology tells, in a paper on The Food of Birds[1] why he adopted the volumetric method of tabulating the contents of bird stomachs and says, "The comparison, however, is merely a quantitative one. . . . It is evident, therefore, that we cannot get at any close estimate of the economic values of this species in this indiscriminate way. . . . (and referring to insects in particular) the opinions of entomologists would probably be found to differ somewhat widely on the question of the relative values of these various elements, and each must form his own opinion from the data given" (pp. 102, 103). These remarks clearly show that Forbes recognized the necessity of interpretation of the results of stomach analysis—a recognition he put in deeds also by studies of the food of ground and lady-bird beetles so that their significance in the food of birds could be more accurately appraised. Forbes pursued his researches in the field as well as in the laboratory.

In 1897 F. E. L. Beal in commenting[2] on Gilmour's statement that even the consumption of waste grain by rooks must be counted against the birds, as it shows their taste for grain, says, "This is not fair. Grain so obtained has no value to the farmer and should not be reckoned as a loss."

In 1904 Professor Beal noted in a discussion[3] of the California linnet or house finch that "fruit forms only 9 per cent of the annual food; consequently if the birds . . . were not so superabundant, the

[1]Bull. Ill. State Lab. Nat. Hist. (I) 1 (3) Nov., 1880, pp. 80-148.
[2]The Auk, 14 (1), Jan., 1897, p. 11.
[3]Yearbook U. S. Dept. Agr., 1904, pp. 246-247.

harm done by them would scarcely attract attention. Their immense numbers cause the comparatively small percentage of fruit destroyed to swell into an enormous aggregate." The influence of local overabundance of birds on crop damage was a frequent topic of discussion by Professor Beal and together with the statements here quoted clearly shows recognition on his part of the necessity of interpreting the results of stomach analysis. It may be added that Professor Beal employed field work to a large extent in his studies.

In 1901 Sylvester D. Judd stated:[4] "It is not easy to determine the exact relation of birds to agriculture, even though all of the constituents of the food are known; for the actual ratio of benefit to injury in the food habits can only be roughly approximated." Judd describes various methods of investigation in economic ornithology and recommends a combination of field work with stomach examination (pp. 11-18).

In 1912 the reviewer explained[5] that "no one claims that percentages do express economic values. They are simply convenient 1912.
handles to facts and they must be interpreted" (p. 452), and "it is very evident that interpretation of economic values is the most important point in presenting the results of stomach examination" (p. 453).

The reviewer has carried on field work in economic ornithology during a considerable part of his time for more than twenty-five years, and in connection with one project that he inaugurated—food resources of wild fowl—more field work has been done by him and his colleagues than on any other food habits undertaking of the Biological Survey.

Kalmbach charges that a fallacy has existed in that results of stomach analysis have been regarded as the end product. The quotations made here indicate that at least four of those cited by Kalmbach as leading students of economic ornithology have not entertained the "fallacy".

"To set forth the general course open to a fuller, a fairer, and withal, a scientific appraisal of the economics of bird life. Intensive field observations, which, in the attainment of their own peculiar objectives, may be conducted just as accurately and yield a product just as scientific as the painstaking work of the laboratory, come foremost" (p. 89).

The objectives certainly would have to be very closely limited to give validity to this dictum. As noted previously they can only

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[4]Bull. 15, U. S. Biol. Survey, p. 17.

[5]Methods of Estimating the Contents of Bird Stomachs, Auk, 29 (4), Oct.,

concern readily measurable things, that is, almost exclusively crops. Field observations may yield valuable information supplementing stomach analysis in various directions, but from the very nature of things (except in the directions indicated) they can not be as accurate as laboratory work. To put the matter tersely, it is apparent that we can learn more about the harmful traits of birds by field observation and more about their beneficial tendencies by laboratory investigation. The two activities complement each other and to attempt to substitute either for the other in its proper sphere is a mistake.

Actual demand at the present time for work in economic ornithology certainly is just as strong for further laboratory investigation as it is for that in the field. In fact every field study brings its own problems that require laboratory analysis for their solution. Every one of the recent game bird investigations, and every one of the modern game management projects has produced its demands for analyses of stomach contents, feces, and pellets. Great need has arisen for information on the food of the birds concerned, their competitors, and predators, and appeals have been made in embarrassing volume to the food habits research laboratory of the Biological Survey, the only public agency from which the desired assistance can be obtained. More than 5,600 food analyses have been made of the game birds alone and hundreds of stomachs and crops are on hand waiting examination.

To sum up, it must be stated, contrary to the conclusions of some readers of Kalmbach's paper, that the method of laboratory analysis is still quite alive and in great demand as a food habits research procedure.

It can not be replaced by field work but can be valuably supplemented by that method. It should not be assumed that field work has been neglected in studies of economic ornithology in the United States. In fact, policies of the Biological Survey have always called for a combination of field and laboratory investigations and these policies have been carried out whenever practicable.

It must not be forgotten that field work has its limitations the same as laboratory work, and that it has the added disadvantage that it can never be carried on extensively enough to represent local conditions in all parts of the country. In other words, a general picture of the economic ornithology of the United States can never be obtained by field work alone, but only by intensive use of all available methods of food habits research.

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ADDITIONAL IOWA SPECIES OF BIRDS SUBSTANTIATED BY SPECIMENS

BY PHILIP A. DU MONT

In a recent review[1] of "A Revised List of the Birds of Iowa"[2] it was stated that twenty-seven species of birds included in this list were unsubstantiated by specimens. Attention is directed to a mimeographed report[3] issued by the writer to bird students in Iowa enumerating thirty-five species as those actually deficient of specimens at the time of publication. These were as follows: Red-throated Loon, Western Grebe, Water Turkey, Man-o'-war-bird, Little Blue Heron, Snowy Egret, Wood Ibis, Cinnamon Teal, American Scoter, Harris's Hawk, Black Rail, Hudsonian Curlew, Black-necked Stilt, Louisiana Paroquet, Burrowing Owl, Great Gray Owl, Nuttall's Poor-will, Red-shafted Flicker, Lewis's Woodpecker, Arctic Three-toed Woodpecker, Say's Phoebe, American Raven, Common Rock Wren, Eastern Mockingbird, Sprague's Pipit, Sycamore Warbler, Hooded Warbler, Northern Prairie Warbler, Western Blue Grosbeak, Lazuli Bunting, Gray-crowned Rosy Finch, Greater Redpoll, Lark Bunting, McCown's Longspur, and Chestnut-collared Longspur.

Of this list of thirty-five species twenty-nine were formerly represented by collected specimens believed to be unsaved or since have been destroyed. One species (Western Blue Grosbeak) of the six heretofore unrepresented by specimens has been collected since the publication of the list. Therefore, only the Western Grebe, Wood Ibis, Lewis's Woodpecker, Say's Phoebe, and Lazuli Bunting have been credited to Iowa without the actual taking of a specimen or the securing of an authentic set of eggs.

Since the publication of "A Revised List of the Birds of Iowa" in 1933 specimens or the eggs of twelve species of birds which were taken in Iowa and which were included in that list have been found or collected.

RED-THROATED LOON. *Gavia stellata.* The mounted specimen reported as being in Keokuk and taken on the Des Moines River near Ottumwa, Iowa, has been found in the collection of mounted birds in the Keokuk High School. This specimen was examined by the writer on May 10, 1934. Mr. E. H. Purcell of Keokuk, in checking the data, wrote that this bird, a male in winter plumage, was taken by Heiser on April 28, 1873.

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[1]WILSON BULLETIN, XLV, No. 4, pp. 206-208.

[2]Univ. Iowa Studies, Nat. Hist., XV, No. 5, pp. 1-171.

[3]Mimeographed bulletin, 60 copies issued from Spencer, Iowa, on February 22, 1934.

Little Blue Heron. *Florida caerulea caerulea.* Two juvenile males were secured by Logan J. Bennett and Gerald B. Spawn, both of Ames, on July 24, 1934, along the south side of Elk Lake in Clay County. Both of these specimens are in the collection of the Department of Zoology, Iowa State College, Ames, and have been examined by the writer.

Cinnamon Teal. *Querquedula cyanoptera.* An adult male is contained in the Stempel collection at Macedonia, Iowa. M. A. Stempel advised me he had killed the bird from a flock of about fifteen Blue-winged Teal, three-quarters of a mile west of Macedonia, Pottawattamie County, during late April in the late '90s. The specimen was examined by the writer on November 9, 1934.

American Scoter. *Oidemia americana.* On April 6, 1934, Prof. W. E. Praeger of Kalamazoo, Michigan, wrote that the specimen of American Scoter which was "probably shot on the Des Moines Rapids" on October 31, 1894, was still in his possession.

Hudsonian Curlew. *Phaeopus hudsonicus.* On April 3, 1935, P. A. Taverner, Curator of Birds at the National Museum of Canada at Ottawa, wrote that the specimen of Hudsonian Curlew which Rudolph M. Anderson had collected on the prairie west of Crystal Lake, Hancock County, May 25, 1895, had been deposited in their museum where it now is, in good condition. It is No. 17464 in the museum catalogue. Taverner stated that there was no question as to the identity.

Louisiana Paroquet. *Conuropsis carolinensis ludovicianus.* On January 24, 1934, Prof. Myron H. Swenk wrote as follows: "In the United States National Museum collection are specimens of the Louisiana Paroquet (*Conuropsis carolinensis ludovicianus*) that were taken on 'Bald Island' by Dr. F. V. Hayden in the spring of 1856, I believe it was. I have identified 'Bald Island' through Lieutenant G. K. Warren's map with McKissock Island at the Otoe-Nemaha County line, which now has been cut off from Nebraska and lies entirely east of the Missouri River though technically still a part of Nebraska."

In answer to my letter of June 18 to the U. S. National Museum endeavoring to determine the present existence of a substantiating specimen from this point of intersection for Nebraska-Iowa-Missouri, Mr. J. H. Riley, Assistant Curator of Birds, sent the following reply on June 21: "There were originally eleven specimens of paroquets received through Lt. Warren, all presumably from Bald Island. The locality of three of these is in doubt, however, as it was not so speci-

fied in the catalogue. Baird, Pacific Railroad Reports, Vol. 9, 1858, p. 68, gives twelve specimens, but one of this number is duplicated and the specimen marked 'fresh', and it may not have been saved. Three of his numbers are also not definite as to locality, one simply marked 'Nebraska' and other two blank. Of the eleven specimens only one skin remains in the study series of the National Museum, though a few may have been used in an old mounted group of which the individual data have been lost. Seven were exchanged or given away. Four were sent to Verreaux, Paris, two to the University of Michigan, and one to Dr. Henry Bryant, later becoming the property of the Museum of Comparative Zoology, and the type of *Conuropsis carolinensis interior* Bangs, Proc. New England Zool. Club, Vol. 4, 1913, p. 94. The skin remaining in the study series is a typical *Conuropsis carolinensis ludovicianus*." (See also the full account of the occurrence of this bird along the Missouri River Valley, as contained in the *Nebraska Bird Review* II, pp. 55-59).

Western Burrowing Owl. *Speotyto cunicularia hypugaea.* A male and a female in the study collection of the Department of Zoology, Iowa State College, Ames, were secured by Logan J. Bennett one-half mile north of Elk Lake, Clay County, July 13, 1933. These specimens were recently examined by the writer.

Red-shafted Flicker. *Colaptes cafer collaris.* Mr. Frank C. Pellett of Hamilton, Illinois, wrote on December 6, 1933, that the specimen which he secured near Atlantic, Cass County, September 25, 1896, still remained in his private collection at Atlantic. A male of this species was collected by J. R. Harlan, in Van Buren County, on October 22, 1933. On December 26, 1934, the writer collected an adult male Red-shafted Flicker along Walnut Creek in Des Moines, Polk County. The moustache marks of both this specimen and the one secured by Harlan show only a trace of black basally and the quills of wings and tail are bright orange.

Prairie Warbler. *Dendroica discolor.* Mr. Ed. S. Currier of Portland, Oregon, wrote on January 16, 1935, that he had found only one nest of this species in Lee County, Iowa. That was on June 5, 1886. The eggs, which were fresh, are number 422 and are still in Currier's Collection.

Hooded Warbler. *Wilsonia citrina.* In Mr. Ed. S. Currier's letter of January 16, 1935, from Portland, Oregon, he stated that in his

collecting along the Mississippi River that he had found a total of twenty-five nests of this species, two being in Lee County, Iowa, and the others were in Missouri. The nests taken in Iowa were on June 24, 1894, in the bottom-land not far from the mouth of the Des Moines River. These two sets are numbered 2274 and 2275 in the Currier Collection.

Western Blue Grosbeak. *Guiraca caerulea interfusa.* Mr. Wm. Youngworth of Sioux City, Iowa, collected one of two birds, a male, found two and one-half miles north of Sioux City along the Big Sioux River in Plymouth County, June 23, 1934. Youngworth had observed birds of this species in the vicinity on previous occasions. This is believed to be the first Iowa-taken specimen. It remains in the Youngworth collection (see Wilson Bulletin, XLVI, p. 257) where the writer was allowed to examine it on July 1, 1934.

McCown's Longspur. *Rhynchophanes mccowni.* There are three mounted specimens, two males and a female, contained in the private collection of the late Dr. George E. Stempel of Macedonia, Iowa. These birds, in spring plumage, were taken by Dr. Stempel near Macedonia, Pottawattamie County, about 1886. This collection, displayed in the town hall, is now under the custodianship of M. A. Stempel, a son, who supplied these data at the time the writer examined the collection, November 9, 1934.

The "Revised List of the Birds of Iowa" contained 364 species of birds known to have occurred in the state as well as eighteen others whose occurrence was considered hypothetical. The taking of a Black Vulture (No. 365) was appended in a footnote on page 44 (see also the Wilson Bulletin, XLV, p. 203). The securing by the writer of what is probably the only Iowa specimen of Shufeldt's Junco is related in the Wilson Bulletin, XLVI, pp. 200-201.

The writer has prepared notes on the recent discovery of an Iowa specimen of the European Widgeon, the taking of specimens of the Brown-headed Nuthatch during 1893 in Lee County, and the recent capture of a Chuck-will's-widow in the same county. Unfortunately, specimens of neither of the last two species were saved.

Therefore the Iowa list of birds now totals 369 species and subspecies of which all but twenty-five are represented by preserved specimens.

Des Moines, Iowa.

THE BIRDS OF FORT SISSETON, SOUTH DAKOTA, A SIXTY YEAR COMPARISON

BY WM. YOUNGWORTH

The location of old Fort Sisseton is in Marshall County, in the extreme northeastern corner of South Dakota. The old fort buildings are being restored at the present time by workers from a Federal Transient Camp and the fort area will then become a state park. It was here that Dr. Charles E. McChesney spent the years from 1875 to 1878 as acting assistant surgeon, and it was in this region that he studied ornithology.

In his publication, "Notes on the Birds of Fort Sisseton, Dakota Territory" (1879), he mentions that he often traveled fifteen to twenty miles or more, in different directions from the post. In his letter of transmittal, of the above mentioned paper, to the United States Geological Survey, Dr. McChesney says the following of the above mentioned areas which he traveled over: "In many respects, the region differs from any other part of the Northwest. The 'Coteau des Prairies' consists of an extensive plateau, rising, somewhat abruptly, nearly four hundred feet above the level of the surrounding country, having a length of over one hundred miles, and a variable width of from twenty to forty miles. Upon this elevated plateau are many lakes, which are the annual resort of thousands of waders and wild fowl, and the region differs greatly in its fauna from that of the lower country."

There have been many interesting changes in the bird life of this region. Settlement of the country has caused extermination of some species and a definite increase in certain other species. The writer will discuss briefly the status of some of these species in the annotations. The statements are based on observations made from five trips to the region. The first trip was during June, 1929; following trips were made in July, 1929, June, 1930, June, 1931, and June, 1935.

Again referring to Dr. McChesney's letter of transmittal, it must also be stated that when he included three western forms of grouse, he did not indicate that the birds had ever been observed at Fort Sisseton. Dr. McChesney merely included the Dusky Grouse, Sage Grouse, and Rocky Mountain Ruffed Grouse for the benefit of army officers in western Dakota and Montana, who were interested in bird life and desired a description of the birds.

The writer is greatly indebted to Mr. W. F. Kubichek of the United States Bureau of Biological Survey, Washington, D. C., for permission to use some of his records in this paper. Furthermore,

this work could not have been completed without the generous aid of Mr. Arthur Lundquist, pathologist at Peabody Hospital, Webster, South Dakota, Dr. T. C. Stephens of Morningside College, Sioux City, Iowa, and Mr. Chas. J. Spiker, formerly of the National Park Service, Washington, D. C.

Mr. Lundquist is a veteran field man and has entered the bird banding field in a wholesale manner. He has probably banded more immature Double-crested Cormorants than any other individual bander in the United States. There is an account of his work in the WILSON BULLETIN for December, 1932.

This list of birds is not presented as a complete catalogue, for a list of a given region can never be fully complete, but it is merely an effort to bridge the gap of some sixty years of time and to show some of the changes that have occurred. Binomial nomenclature is used wherever possible. The asterisk (*) is used to denote species found by Dr. McChesney, numbering 154 forms. Seventy-seven additional species have been added to Dr. McChesney's list, bringing the total to 231 species. Species which we consider as summer residents in this region are denoted by the symbol °, after the asterisk.

COMMON LOON. *Gavia immer.** Dr. McChesney reported great numbers of loons, but at present the loon is an uncommon migrant.

HOLBOELL'S GREBE. *Colymbus grisegena holboelli.*° This large grebe is a common summer resident on the various lakes on the Coteau and was evidently overlooked by McChesney. The hoarse cries of this bird are characteristic of the rush-filled sloughs of the region.

HORNED GREBE. *Colymbus auritus.*° This bird is not found as a common species and has not been seen in numbers. Indications are that it breeds sparingly in the Rush Lake region. It was not listed by Dr. McChesney.

EARED GREBE. *Colymbus nigricollis californicus.*° The Eared Grebe is a very common summer bird and often many colonies of several hundred birds each were found breeding on Rush Lake. Mr. Kubichek has worked in such colonies and reports nests scattered everywhere. This is another species not mentioned by McChesney.

WESTERN GREBE. *Aechmophorus occidentalis.*°° A beautiful bird when seen in its natural surroundings and while mentioned in 1878 as occasional in migration, it is today found by hundreds on Rush Lake and other lakes of the region. Mr. Kubichek has perhaps made a more thorough study of this species than any other ornithologist of the day, and he thinks that the species is holding its own in the area under consideration.

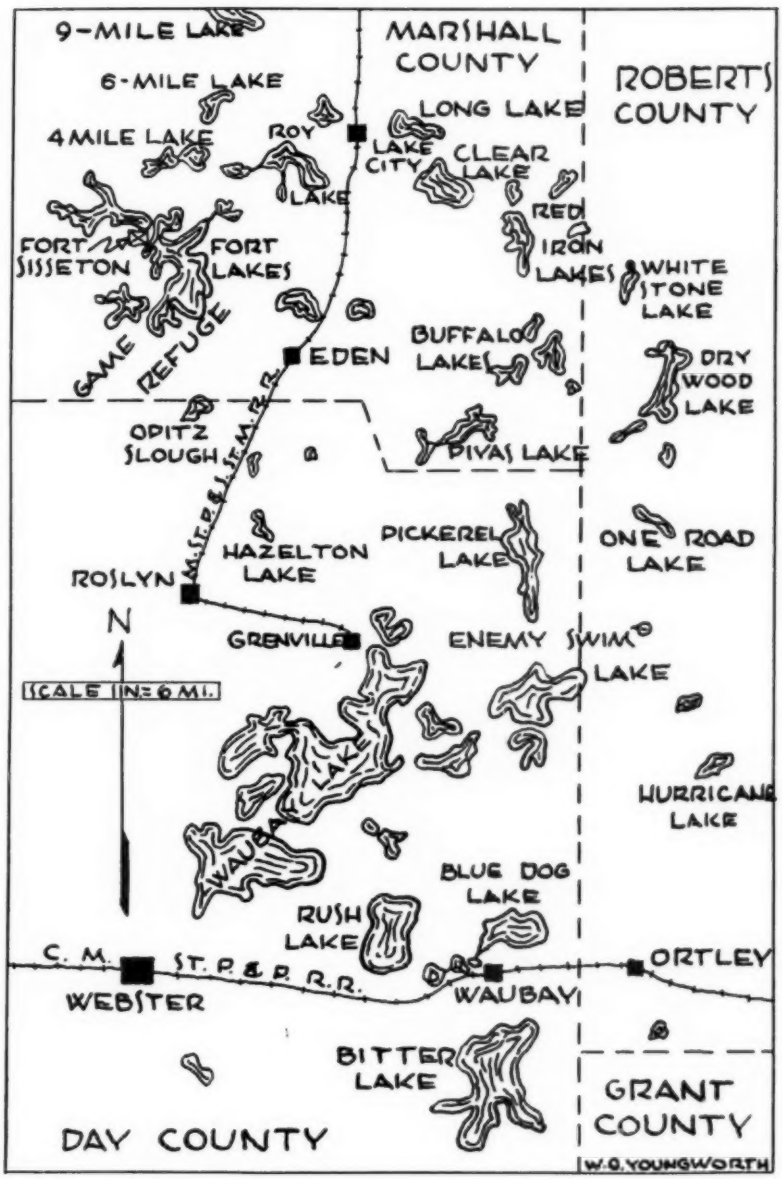

Fig. 22. The lakes of the Fort Sisseton country, in Marshall, Day, and Roberts Counties.

PIED-BILLED GREBE. *Podilymbus podiceps.**° A very common bird over the entire Coteau today, as in the early days.

WHITE PELICAN. *Pelecanus erythrorhynchos.** A regular migrant on the larger lakes, but it is not a breeding bird, although in some years pelicans stay throughout the summer on the Waubay Lakes.

DOUBLE-CRESTED CORMORANT. *Phalacrocorax auritus.**° This big bird is still a common breeder despite constant shooting, and fine colonies nest on islands in South Waubay and Cattail Lakes. A large colony was recently destroyed on Roy Lake, not far from the old fort.

GREAT BLUE HERON. *Ardea herodias.** A regular migrant, and it probably breeds in small numbers in this area.

AMERICAN EGRET. *Casmerodius albus egretta.* A single bird was taken by Mr. Kubichek in 1929, and was the first authentic record for the state of South Dakota. Details of this record have been published in *Iowa Bird Life* for September, 1929.

GREEN HERON. *Butorides virescens.**° Not any more common than in the days of McChesney's travels.

BLACK-CROWNED NIGHT HERON. *Nycticorax nycticorax hoactli.**° Dr. McChesney did not locate a breeding colony of this species. Today, a large colony of birds nest on a wooded island in Rush Lake and are usually bothered by a family or two of Crows.

AMERICAN BITTERN. *Botaurus lentiginosus.**° Still found as a regular summer resident in suitable habitat.

LEAST BITTERN. *Ixobrychus exilis exilis.*° This tiny bittern was not found by McChesney and although it has been found breeding on the Coteau, it is not a very common bird. On June 6, 1931, a pair of Least Bitterns were observed at their nest on Rush Lake.

WHISTLING SWAN. *Cygnus columbianus.* Mr. Lundquist reported to me, that he sees small flocks of these fine birds nearly every year on the larger lakes.

TRUMPETER SWAN. *Cygnus buccinator.** The Trumpeter Swan is almost a bird of the past and is not now found in the Sisseton country, as it was in the days of Dr. McChesney.

CANADA GOOSE. *Branta canadensis.** This goose passes through in large numbers, but the flocks are probably concentrated to a large extent, and it appears to the observer that the birds are not decreasing in numbers, yet we know that the number of geese is sadly depleted. Mr. Kubichek has taken specimens of the intermediate or Lesser Canada Goose.

WHITE-FRONTED GOOSE. *Anser albifrons albifrons.* Not mentioned by McChesney. This goose is a regular migrant, but not as common as the other forms.

SNOW GOOSE. *Chen hyperborea hyperborea.** A common migrant in the spring and is often found resting near the larger lakes for some days at a time.

BLUE GOOSE. *Chen caerulescens.** Probably more common than the Lesser Snow Goose and usually associated with that species while passing through this territory.

MALLARD. *Anas platyrhynchos platyrhynchos.*°* The Mallard is a breeding bird and fairly large flights still occur in the fall of the year.

BLACK DUCK. *Anas rubripes.* This duck was not seen by Dr. McChesney. Mr. Lundquist says that a few Black Ducks are shot by hunters nearly every fall.

GADWALL. *Chaulelasmus streperus.*°* The Gadwall is still a breeding bird and a regular migrant through the Coteau des Prairies.

BALDPATE. *Mareca americana.*°* This species is a fall and spring migrant and some of the late birds still nest in this area.

PINTAIL. *Dafila acuta tzitzihoa.*°* The Pintail is still considered a summer resident and quite a few are taken each fall by hunters.

GREEN-WINGED TEAL. *Nettion carolinense.*°* A beautiful little fowl, which is still a regular migrant, but a rather uncommon summer breeder. A pair of these birds was found at Bitter Lake on June 7, 1929.

BLUE-WINGED TEAL. *Querquedula discors.*°* The little blue-wing is one of the common nesting ducks found on the Coteau and many pleasant hours have been spent in watching this species during nidification.

CINNAMON TEAL. *Querquedula cyanoptera.* Mr. Lundquist writes that one or two have been shot by hunters since he has been hunting at Opitz Slough.

SHOVELLER. *Spatula clypeata.*°* The Spoon-bill is still found as a regular summer resident near Fort Sisseton.

WOOD DUCK. *Aix sponsa.** Dr. McChesney reports a single specimen of this species. Hunters still take an occasional Wood Duck but doubtless the birds are shot by mistake.

REDHEAD. *Nyroca americana.*°* Not an uncommon breeding bird and a regular migrant.

Ring-necked Duck. *Nyroca collaris.*° This species was not distinguished by Dr. McChesney. A regular migrant and possibly a few remain to breed, as birds have been seen in June.

Canvas-back. *Nyroca valisineria.**° Not as common as the Redhead and only a few birds remain to breed. A nice nest was found in 1931 by Mr. Kubichek.

Scaup Duck. *Nyroca marila.** Dr. McChesney found this duck in some numbers during the fall migration.

Lesser Scaup Duck. *Nyroca affinis.**° This species is a regular migrant and a few remain to breed.

Golden-eye. *Glaucionetta clangula americana.**° Were found in the past in some numbers, this is hardly true today on the Coteau. Mr. Lundquist found the species breeding at Rush Lake during June, 1930. Two pairs were seen at Spring Lake on June 6, 1935, by the author.

Barrow's Golden-eye. *Glaucionetta islandica.** Dr. McChesney reports a few specimens during the spring migration. There are no recent records of the species from this region.

Buffle-head. *Charitonetta albeola.** The little Spirit Duck is not as common during migration, as it was back in 1878. Protection might restore it to some extent and preserve the species for a few years more.

Old-squaw. *Clangula hyemalis.* A rare migrant in the Fort Sisseton country. Mr. Lundquist has taken this species during the hunting season.

White-winged Scoter. *Melanitta deglandi.* The scoters were not reported by Dr. McChesney. This species is not rare and some are shot nearly every fall.

Surf Scoter. *Melanitta perspicullata.* This species is not seen as often as the preceding species and is usually found on the more open lakes.

Ruddy Duck. *Erismatura jamaicensis rubida.**° Dr. McChesney found this duck as rare, while recently we have found it as common and a regular breeding bird over the whole region..

Hooded Merganser. *Lophodytes cucullatus.** Still found as a migrant, considered almost common in some years.

American Merganser. *Mergus merganser americanus.** This large duck is also a regular migrant throughout the Sisseton country.

Turkey Vulture. *Cathartes aura septentrionalis.** Reported by McChesney as a common breeding bird. The vulture is not common any more, and only one bird was reported in 1931 by Mr. Lundquist.

FIG. 23. Old Fort Sisseton, looking across the parade ground to the officers' quarters.

FIG. 24. Ruins of the powder house at Fort Sisseton.

Swallow-tailed Kite. *Elanoides forficatus forficatus.** This beautiful hawk was not rare in the early days about Fort Sisseton. Today, it has disappeared from the entire northwest and is another of the vanishing species.

Goshawk. *Astur atricapillus.* The Goshawk was not mentioned by McChesney in his report. Mr. Lundquist reports that during certain fall seasons this hawk is a very common species.

Sharp-shinned Hawk. *Accipiter velox velox.*°° This small hawk was found as a summer resident in 1878 and is still not uncommon around the old fort.

Cooper's Hawk. *Accipiter cooperi.*°° The Cooper's Hawk is one of the medium sized hawks which is apparently still holding its own in this part of the country.

Red-tailed Hawk. *Buteo borealis.*°° The four forms of the Red-tailed Hawk still pass through this region, but hardly in the numbers that they must have mustered back in the cavalry days of the West.

Broad-winged Hawk. *Buteo platypterus platypterus.* This small buteo was not reported by Dr. McChesney. It is now found as a rare summer visitor.

Swainson's Hawk. *Buteo swainsoni.*°° In the old days of vast undisturbed prairies, the Swainson's Buzzard was a very common breeding bird. Now it is confined largely to the Missouri River region and is uncommon around Fort Sisseton.

American Rough-legged Hawk. *Buteo lagopus s. johannis.* The rough-legs were not found by McChesney during his stay. At the present time the rough-leg is a regular migrant and there are a number of mounted birds in the city of Webster.

Ferruginous Rough-leg. *Buteo regalis.* This species is not common like the former species.

Golden Eagle. *Aquila chrysaëtos canadensis.** The Golden Eagle is a regular migrant at Fort Sisseton. Mr. Lundquist says that this eagle is not uncommon in some falls.

Bald Eagle. *Haliaeetus leucocephalus.** This species also is found as a migrant, but not as often as the Golden Eagle.

Marsh Hawk. *Circus hudsonius.** The Marsh Harrier is of course the most common of the summer hawks, as it was in the days of Dr. McChesney.

Osprey. *Pandion haliaëtus carolinensis.* A very uncommon migrant.

Duck Hawk. *Falco peregrinus.** Dr. McChesney says that a few of these hawks stayed during the summer. The writer saw one on

June 5, 1931, which was having a thrilling aerial battle with a male Marsh Hawk.

PIGEON HAWK. *Falco columbarius.** This small falcon is still a regular migrant. To date it has not been found breeding on the Coteau.

SPARROW HAWK. *Falco sparverius.*°* The Sparrow Hawk is one of the small hawks, which has not decreased in numbers and is common during the summer season.

PRAIRIE CHICKEN. *Tympanuchus cupido americanus.*°* The Prairie Hen nests on the Coteau in diminished numbers and will probably be crowded out by over-pasturing of land, rather than by more direct human contacts.

SHARP-TAILED GROUSE. *Pedioecetes phasianellus.*°* This light colored grouse is still found in very small numbers in the Fort Sisseton country.

EUROPEAN PARTRIDGE. *Perdix Perdix.*° This fine game bird has been introduced to the Coteau in recent years and is spreading rapidly everywhere. The writer believes that this bird and the Ring-necked Pheasant will in time crowd out the native Prairie Hen and Prairie Sharp-tailed Grouse.

BOB-WHITE. *Colinus virginianus virginianus.*° Quail apparently had not reached the Fort Sisseton region when Dr. McChesney was there, but at present are found in small numbers in various wooded areas.

RING-NECKED PHEASANT. *Phasianus colchicus torquatus.*° A foreign bird which is becoming very common.

WHOOPING CRANE. *Grus americana.** A fine bird, which is nearly extinct. There have been no recent reports from the region of this species, which was not considered common even back fifty years ago.

SANDHILL CRANE. *Grus canadensis.** The Sandhill Crane formerly bred on the Coteau, but at the present time it is an uncommon bird even as a migrant.

VIRGINIA RAIL. *Rallus limicola limicola.*° This species, which was not seen by Dr. McChesney, is not an uncommon summer resident and the nest has been found on the Coteau by Mr. Kubichek.

SORA. *Porzana carolina.*°* An interesting little bird, which breeds in this region and is best studied from a blind.

FLORIDA GALLINULE. *Gallinula chloropus cachinnans.*° The gallinule is a bird of the rush-filled lakes and was not listed by McChesney. It is a bird which is definitely in the class of skulkers and keeps close to cover in most cases.

American Coot. *Fulica americana americana.**○ The coot is one of the most common of the summer birds and is found in all the sloughs and pot-holes.

Piping Plover. *Charadrius melodus.*○ The sweet voiced little piper was not found in 1878, but now the bird is a regular summer resident along some of the more open prairie lakes.

Semipalmated Plover. *Charadrius semipalmatus.** This plover is a regular migrant now as it was in the early days. It occurs both in the spring and fall.

Killdeer. *Oxyechus vociferus vociferus.**○ The Killdeer is one of the plovers which has not been decreased in numbers by the settling up of the land, and is apparently as common as it was sixty years ago.

Golden Plover. *Pluvialis dominica dominica.** Dr. McChesney gives a fine account of the wonderful flights of plovers, both spring and fall, in which flocks of thousands were constantly flying over. Such flights of Golden Plovers are, of course, only a memory and now one is indeed a fortunate ornithologist who sees a flock of a few hundred birds.

Black-bellied Plover. *Squatarola squatarola.** Dr. McChesney states that he did not find this plover during the spring migration; however, it does come through in the spring and existing records would point to its abundance then, rather than in the fall. At this writing, however, the Black-bellied Plover is not a common migrant in any sense of the word.

Ruddy Turnstone. *Arenaria interpres morinella.** The attractively marked Turnstone is a regular migrant as it was in former times and one is often privileged to see hundreds of the birds feeding in fields of sprouting corn. Smaller flocks are also found along the gravel beaches.

American Woodcock. *Philohela minor.** During 1877 and 1878 a few woodcocks were shot near the fort, but in recent years, according to Mr. Lundquist, this bird has not been found by hunters.

Wilson's Snipe. *Capella delicata.** The snipe is a regular migrant and a few possibly remain to breed as they did years ago.

Long-billed Curlew. *Numenius americanus.** This splendid bird, once common over the Great Plains, has left the Fort Sisseton country and has not been reported even as a migrant for many years.

Hudsonian Curlew. *Phaeopus hudsonicus.** Dr. McChesney did not find this bird at Fort Sisseton, although he gives it in his list. No definite reports of the bird are forthcoming in recent years.

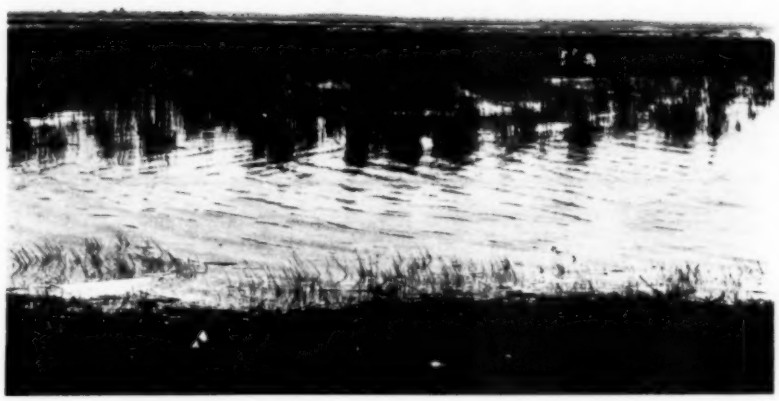

FIG. 25. Rush Lake, home of the Western Grebe.

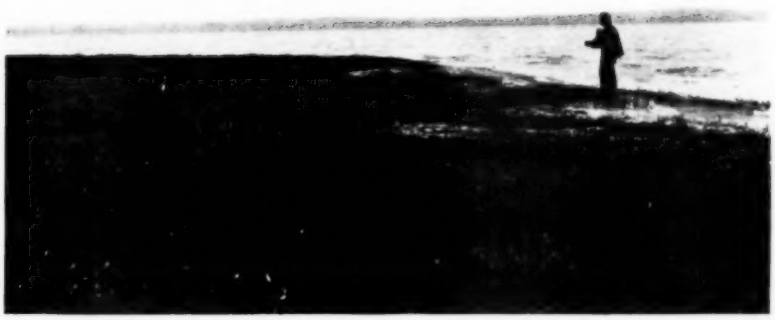

FIG. 26. Bitter Lake. Along this shore line nested the Marbled Godwit, Upland Plover, Willet, and Piping Plover.

Eskimo Curlew. *Phaeopus borealis.** Another of the vanishing species which was once so common on the Coteau during migration. Not reported for many years.

Upland Plover. *Bartramia longicauda.*°* A fine game bird, which was formerly most abundant around Fort Sisseton during the summer time. At present the bird is found in limited numbers and present day observers believe that while this valuable bird is slowly increasing in numbers, it can never return to its former status.

Spotted Sandpiper. *Actitis macularia.*°* The Spotted Sandpiper has not decreased in numbers and is found as a common summer resident. Nests can usually be found on the islands in Waubay Lake.

Solitary Sandpiper. *Tringa solitaria.* This common migrating species was overlooked by McChesney and is today found in both spring and fall.

Willet. *Catoptrophorus semipalmatus.*°* A very interesting wader, which seems to be gradually losing out as a summer resident of the Coteau. Three or four years ago the Willet was found breeding in quite a few places, but last year it seemed to be nearly absent.

Greater Yellow-legs. *Totanus melanoleucus.** The Greater Tattler is not a common migrant and is slowly losing out like all of the larger shore birds.

Lesser Yellow-legs. *Totanus flavipes.** Dr. McChesney states that this bird bred in the vicinity, which is hardly the case at this writing. The yellow-legs is, however, one of the most common of all the migrating shore-birds.

Pectoral Sandpiper. *Pisobia melanotos.** A medium sized wader, which has not suffered greatly from hunters and which still continues to pass to and fro through the prairie region.

White-rumped Sandpiper. *Pisobia fuscicollis.** One of the small peeps, which are so common during migration time.

Baird's Sandpiper. *Pisobia bairdi.** This sandpiper is a regular migrant over the Coteau. An interesting observation was made by Professor Kubichek in that the Baird's Sandpiper seems to migrate earlier than the other species and is often found while the geese are still migrating north.

Least Sandpiper. *Pisobia minutilla.** A regular migrant.

Red-backed Sandpiper. *Pelidna alpina sakhalina.* This well marked bird was missed by Dr. McChesney and is today found as a regular migrant. During the first week of June, 1930, several small flocks of this sandpiper were seen near Rush Lake and some were taken.

DOWITCHER. *Limnodromus griseus.** Formerly a common migrant and considered a fine table bird by Dr. McChesney. Now the bird is an uncommon migrant and is not the most familiar of the waders as it was in the days of yore.

STILT SANDPIPER. *Micropalama himantopus.* A well known species, which was not found by McChesney. At times found as one of the commoner waders. On June 5, 1930, a flock of about 500 Stilt Sandpipers were seen on the west shore of Rush Lake.

SEMIPALMATED SANDPIPER. *Ereunetes pusillus.** Probably without question the most abundant of all migrating sandpipers.

BUFF-BREASTED SANDPIPER. *Tryngites subruficollis.** A strange little sandpiper, which was taken by Dr. McChesney in small numbers.

MARBLED GODWIT. *Limosa fedoa.*°* Strangely Dr. McChesney reports this godwit as common and yet not breeding on the Coteau. Professor Kubichek has found many nests of the bird at various places and at this writing it is found much more frequently than the Willet. These two species suffer heavily from over-pasturing.

HUDSONIAN GODWIT. *Limosa haemastica.** Much more common in 1878 than at present, as is the case with all the larger waders. Dr. McChesney said it did not stay to breed.

SANDERLING. *Crocethia alba.* Another of the shore birds which was not listed by Dr. McChesney. The species is not considered rare by Mr. Kubichek, who has taken birds in various phases of plumage.

AVOCET. *Recurvirostra americana.** A truly beautiful bird, which formerly bred near Fort Sisseton. At present exceedingly rare in migration.

WILSON'S PHALAROPE. *Steganopus tricolor.*°* Wilson's Phalarope nests sparingly on the Coteau, with the bulk of the birds going farther north to pass the nidification period.

NORTHERN PHALAROPE. *Lobipes lobatus.* This phalarope is a regular migrant at Fort Sisseton, but was not reported by Dr. McChesney. Sometimes flocks of several thousand birds are found in this area in the spring. Such a flock of approximately 4,000 birds was found at Bitter Lake on June 2, 1931.

HERRING GULL. *Larus argentatus.** Dr. McChesney gives this gull as a breeding species and as common. This is not true today and it is now considered only as a straggling migrant.

RING-BILLED GULL. *Larus delawarensis.*° This gull was not listed by Dr. McChesney. Today, a fine nesting colony of several hundred birds is to be found on the east island in South Waubay Lake and has apparently been there many years. It is possible that it might nest elsewhere in the region in small numbers.

Franklin's Gull. *Larus pipixcan.**° A trim appearing gull, with a lovely rose blush on the underparts, which often nests on certain rush-filled lakes in countless thousands. Conditions must be right, however, or the birds do not nest. Some years thousands of unmated birds may stay around all summer and feed on insects in the nearby fields. Franklin's Gull is one of the many reasons why the Fort Sisseton country is a bird student's paradise.

Laughing Gull. *Larus atricilla.** Dr. McChesney lists this gull as abundant and breeding, as he also does the Franklin's Gull. There have been no recent records of this species that are substantiated by specimens.

Forster's Tern. *Sterna forsteri.**° Forster's Tern is still a regular summer resident, but it is doubtful whether it is as plentiful as it was fifty years ago.

Common Tern. *Sterna hirundo hirundo.**° This tern appeared to the writer as the more common of the two species. Nice colonies are found on Waubay Lake, Hildebrandt's Lake, and Cottonwood Lake. The birds acted as though they were going to nest on a small island in Roy Lake in June, 1931, and there are probably other small colonies scattered around on the Coteau.

Black Tern. *Chlidonias nigra surinamensis.**° A common summer resident in suitable locations over the entire region.

Mourning Dove. *Zenaidura macroura.**° The Mourning Dove can still be considered a common summer bird on the Coteau, despite open seasons in many western and southern states.

Passenger Pigeon. *Ectopistes migratorius.** According to Dr. McChesney this extinct species was not an especially abundant summer resident about the fort.

Yellow-billed Cuckoo. *Coccyzus americanus americanus.*° An uncommon summer resident, not mentioned by McChesney.

Black-billed Cuckoo. *Coccyzus erythropthalmus.**° The common breeding form, which is found probably in about the same numbers as previously.

Screech Owl. *Otus asio.*° The Screech Owl was not reported by Dr. McChesney during his stay. Now the bird is found as a common resident.

Great Horned Owl. *Bubo virginianus.**° The Great Horned Owl is a sorely persecuted bird in any locality, but despite all this the bird is still found on the Coteau.

Snowy Owl. *Nyctea nyctea.** Reported in small numbers in 1878. In recent years great waves of Snowy Owls have visited the

FIG. 27. Nest of the Western Grebe. The usual clutch of eggs is four, six is rather uncommon.

FIG. 28. Western Grebe nest covered. Usually they do not cover.

Coteau and a great many birds have been killed. Professor Kubichek has found them in the spring while the wild fowl were migrating.

Burrowing Owl. *Speotyto cunicularia hypugaea.*° It is interesting to know that this curious owl apparently did not breed near the post when McChesney lived there; however, at present this owl lives in the hills north of the fort and is not rare.

Long-eared Owl. *Asio wilsonianus.* Not listed by McChesney, while today it is found as a not uncommon owl.

Short-eared Owl. *Asio flammeus flammeus.*° It is rather surprising that this owl was not seen by McChesney. We now find it as a rather frequent breeding bird in the lowlands.

Nighthawk. *Chordeiles minor.**° A common summer resident over the entire Coteau. The lighter colored race called Sennett's Nighthawk appears to be the most common form.

Chimney Swift. *Chaetura pelagica.*° This bird is found about the various towns, which now dot the Coteau. Dr. McChesney does not report this species.

Ruby-throated Hummingbird. *Archilochus colubris.**° This species has probably increased somewhat, especially around the towns, where an abundance of flowers attract it.

Belted Kingfisher. *Megaceryle alcyon.**° Not a very common bird anywhere on the Coteau. In a later note (*Bull. Nutt. Ornith. Club*, IV, 1879, p. 188) Dr. McChesney reported a pair of these birds observed near the post on April 14 and 16, 1879.

Flicker. *Colaptes auratus.**° The Flicker is still found in small numbers about Fort Sisseton and also about the towns in the region. Hybrids between this form and the Red-shafted Flicker have also been seen.

Red-headed Woodpecker. *Melanerpes erythrocephalus.**° This bird is a common summer resident.

Yellow-bellied Sapsucker. *Sphyrapicus varius varius.* The sapsucker is a very uncommon migrant.

Hairy Woodpecker. *Dryobates villosus.**° Dr. McChesney did not think that this species bred in the vicinity at that time. Today, the bird is found as a breeding bird as well as a winter resident.

Downy Woodpecker. *Dryobates pubescens.**° Dr. McChesney did not include this bird in his long list, but in a later note (*Bull. Nutt. Ornith. Club*, IV, 1879, p. 188) he spoke of seeing this species several times in the winter of 1878-79 and collecting a few specimens. The writer has usually found this species nesting in the willow trees in this region.

KINGBIRD. *Tyrannus tryannus.**° The Kingbird is a very common summer bird. Many nests are found in low situations. Dr. Stephens has some fine pictures of these birds nesting in a snowberry thicket.

ARKANSAS KINGBIRD. *Tyrannus verticalis.**° The Western Kingbird is also a common species and seems to get along peaceably with the preceding form. The presence of many planted groves around farm homes and in the towns has led to an increase in the numbers of these two species.

PHOEBE. *Sayornis phoebe.*° The Phoebe is not a common bird anywhere in the region.

YELLOW-BELLIED FLYCATCHER. *Empidonax flaviventris.* This small, dark-colored flycatcher is not an uncommon spring migrant and birds have been seen at various places on the Coteau. It was not previously reported.

ALDER FLYCATCHER. *Empidonax trailli.*° Traill's Flycatcher is probably the most common of the small flycatchers on the Coteau. The writer has found it breeding in brush-land near water and in wild plum thickets on an island in Rush Lake.

LEAST FLYCATCHER. *Empidonax minimus.*° The Least Flycatcher is a regular migrant through the Fort Sisseton country. It remains to breed. The three preceding species were not listed in 1878.

WOOD PEWEE. *Myiochanes virens.**° The writer is inclined to think that this species breeds in small numbers, while Dr. McChesney considered it as a migrant. It was found to be not uncommon in the woods near Opitz Slough in June, 1931.

HORNED LARK. *Octocoris alpestris.**° Dr. McChesney seemed to think that the Horned Lark was merely a migrant or winter visitant. The writer has found the bird as a regular breeding bird in recent years. Late broods are not uncommon in June. There are probably several different forms of the Horned Lark visiting this region during the course of the year.

TREE SWALLOW. *Iridoprocne bicolor.**° Dr. McChesney found this swallow only during one season; however, the bird is now considered a regular migrant and a not uncommon summer resident. Mr. Kubichek found, on one occasion, an unusual nest in a piece of farm machinery.

BANK SWALLOW. *Riparia riparia riparia.**° Still found as a common summer resident in suitable locations.

ROUGH-WINGED SWALLOW. *Stelgidopteryx ruficollis serripennis.*° A migrant in this region and a regular summer resident.

Barn Swallow. *Hirundo erythrogaster.**○ Dr. McChesney speaks of it as found in small numbers. This bird is now found about nearly every farm in the region. This is another species which has increased in numbers due to settling of the country.

Cliff Swallow. *Petrochelidon albifrons albifrons.**○ A regular migrant and summer resident.

Purple Martin. *Progne subis subis.**○ Another species which has become quite common due to the presence of numerous bird houses and other accessible nesting sites. An interesting sight at old Fort Sisseton is the flock of martins, which nest in the now decaying buildings and fly back and forth over the old parade ground.

Blue Jay. *Cyanocitta cristata cristata.**○ A regular summer resident, and found as not uncommon in winter.

American Magpie. *Pica pica hudsonia.* A remarkable invasion of magpies occurred during 1921 and 1922 throughout this entire region. Large numbers of the birds were found around Fort Sisseton and some of the birds stayed during the ensuing summer. There were also some reports of the birds nesting, but we have no actual nests or eggs to back up the reports.

Raven. *Corvus corax.** The Raven was a rare bird about Fort Sisseton even during Dr. McChesney's stay and is not found in the region today.

Crow. *Corvus brachyrhynchos.**○ In 1878 the Crow was considered a rare bird at the post. Today, the bird is a common migrant, but is still an uncommon breeding bird. A pair or two usually nest on the island in Rush Lake and here live and feed their young from the nests of Black-crowned Night Herons. In June, 1931, the writer put an end to their depredations for one year by dispatching the parents and two grown young birds.

Black-capped Chickadee. *Penthestes atricapillus.**○ The chickadee is a regular summer resident, and some stay throughout the coldest winter.

White-breasted Nuthatch. *Sitta carolinensis carolinensis.* Dr. McChesney did not list this species or the following. The common nuthatch is today a regular resident of the region and often a familiar bird around the feeding shelf.

Red-breasted Nuthatch. *Sitta canadensis.* This small nuthatch is found at times in the fall and early winter about the feeding box in Webster and other towns on the Coteau.

Brown Creeper. *Certhia familiaris.* The Brown Creeper was not listed in 1878. This odd little bird is found as a very common

FIG. 29. Nest of Holboell's Grebe on shore of Rush Lake.

FIG. 30. Common Kingbird on nest. In taking this picture the photographer approached on foot till the lens of camera was four feet from bird.

fall and winter resident and its peculiar feeding habits are always a source of interest to one interested in bird life.

House Wren. *Troglodytes aedon.**° The House Wren has also increased greatly in numbers, due to numerous bird houses in both townyards and farmyards. The House Wren has not deserted its original nesting sites however, and is found in the woods as well.

Long-billed Marsh Wren. *Telmatodytes palustris.*° This wren and the following species are the most interesting of the entire family and were apparently overlooked by Dr. McChesney. The Long-billed Marsh Wren is one of the common birds of the sloughs. The little oval grass nests are found everywhere among the beds of scirpus and the tiny birds with bubbling songs are continually flitting ahead of the observer.

Short-billed Marsh Wren. *Cistothorus stellaris.*° This bird is not nearly as common as the above species, mainly because suitable nesting areas are not available in many places. A damp meadow is the home of this wren, with its characteristic chittering song.

Catbird. *Dumatella carolinensis.**° The writer is confident that the Catbird and the Brown Thrasher have increased greatly in numbers since 1878 due to the planting of shrubbery and trees throughout the entire region.

Brown Thrasher. *Toxostoma rufum.**° This bird is often seen about farm homes and along country roads, where trees have been planted.

Robin. *Turdus migratorius.**° Dr. McChesney found the Robin in small numbers and attributed its scarcity to lack of nesting sites. As a species, the Robin has increased enormously and is today one of the most common summer birds around every farm and in every city and village over the entire "Coteau des Prairies".

Hermit Thrush. *Hylocichla guttata.* An uncommon migrant.

Olive-backed Thrush. *Hylocichla ustulata swainsoni.** This thrush was found by Dr. McChesney in small numbers and was also seen by the writer the first week in June, 1931.

Gray-cheeked Thrush. *Hylocichla minima aliciae.* The Gray-cheeked Thrush is a less common migrant than the Olive-backed Thrush.

Bluebird. *Sialia sialis sialis.**° The Bluebird is a regular resident on the Coteau and has also joined the ranks of the bird box nesters around farms and towns.

Cedar Waxwing. *Bombycilla cedrorum.* The gentle mannered waxwing was not listed by McChesney during his stay. In 1931 the writer saw several flocks of the birds near the Waubay Lakes.

Shrike. *Lanius ludovicianus.**° Dr. McChesney collected a single Shrike in 1877. Now the Shrike is a common bird along any roadside which boasts a few trees or shrubs large enough to nest in.

Starling. *Sturnus vulgaris.* Strangely enough the first record of this introduced species in South Dakota came from the Fort Sisseton country. Mr. Lundquist records the first Starling on May 14, 1933, near Lake Minnewashta, Day County. (See Wilson Bulletin for March, 1934).

Yellow-throated Vireo. *Lanivireo flavifrons.* This rather brightly colored vireo has been found to be a not uncommon summer resident in areas where cottonwood trees are growing.

Red-eyed Vireo. *Vireo olivaceus.**° The Red-eyed Vireo is found regularly on the Coteau. Dr. McChesney collected one bird.

Warbling Vireo. *Vireo gilvus.**° Not rare. Dr. McChesney also collected one bird of this species.

Black and White Warbler. *Mniotilta varia.** Still found as a regular migrant and the writer feels that careful search will also reveal it as a rare summer resident, as it has been found nesting at Sioux City, Iowa.

Tennessee Warbler. *Vermivora peregrina.* A very common migrant, not listed by Dr. McChesney. At times it is the most common of migrating warblers.

Orange-crowned Warbler. *Vermivora celata.* A regular migrant, not given by Dr. McChesney.

Parula Warbler. *Compsothlypis americana.* A rare migrant, which was reported by Mr. Lundquist for the first time in the spring of 1927.

Yellow Warbler. *Dendroica aestiva.**° Then as now, one of the common small birds, which remains to breed.

Magnolia Warbler. *Dendroica magnolia.** A migrant, which was found by Dr. McChesney in small numbers and still passes through the region.

Cape May Warbler. *Dendroica tigrina.* One of the rarer warblers, which was first reported by Mr. Lundquist. A specimen has been taken in the region. A warbler of this species was seen on June 3, 1935, near Spring Lake.

Myrtle Warbler. *Dendroica coronata.** Dr. McChesney found this species as a common migrant, as later observers also report it.

Blackburnian Warbler. *Dendroica fusca.** This brilliantly colored bird was reported by Dr. McChesney as a spring migrant.

CHESTNUT-SIDED WARBLER. *Dendroica pensylvanica.** Also listed in the early days. An uncommon migrant today.

BAY-BREASTED WARBLER. *Dendroica castanea.* Mr. Lundquist first observed this bird for the region in 1927.

BLACK-POLL WARBLER. *Dendroica striata.** Still one of the more common migrants of the warbler hosts.

PINE WARBLER. *Dendroica pinus.** The Pine Warbler was found in small numbers by McChesney.

PALM WARBLER. *Dendroica palmarum.* This species has been seen by Mr. Lundquist.

OVENBIRD. *Seiurus aurocapillus.*° Dr. McChesney does not list this species. Recently Mr. Lundquist has found the bird as common in migration. The writer has found that it breeds sparingly in this region.

WATER-THRUSH. *Seiurus noveboracensis.** Dr. McChesney found this species as rare in 1878, it is however a regular migrant.

YELLOW-THROAT. *Geothlypis trichas.*°° Dr. McChesney found the Yellow-throat as a migrant; today, however, it is a common summer resident in suitable locations.

YELLOW-BREASTED CHAT. *Icteria virens.*° During June, 1935, the writer found the Yellow-breasted Chat not uncommon in suitable habitats and now considers this species as a regular summer resident on the Coteau.

WILSON'S WARBLER. *Wilsonia pusilla.* An uncommon migrant on the Coteau.

CANADA WARBLER. *Wilsonia canadensis.** Dr. McChesney found this bird in some numbers, but it did not stay to breed.

AMERICAN REDSRART. *Setophaga ruticilla.*°° Still a regular migrant through the region with a few remaining to breed in the more timbered parts of the Coteau.

ENGLISH SPARROW. *Passer domesticus.*° An introduced species, which, happily, Dr. McChesney did not have to bother with on his field trips. This bird is at present very common around the remains of the old post.

BOBOLINK. *Dolichonyx oryzivorus.*°° In 1878 this bird was very common about Fort Sisseton. At this writing it can hardly be said that the Bobolink is common. The bird is still found in certain meadows, but not in great numbers and seems to be one of the birds which is slowly decreasing in numbers.

WESTERN MEADOWLARK. *Sturnella neglecta.*°° A very common bird in the past and even more common in the present. It often stays in the region until along in November.

FIG. 31. View in Double-crested Cormorant colony on East Island in South Waubay Lake.

FIG. 32. Adult Cormorants in the same colony. Photograph by W. F. Kubichek, and borrowed from WILSON BULLETIN, December, 1932.

YELLOW-HEADED BLACKBIRD. *Xanthocephalus xanthocephalus.**○ The most abundant bird around the numerous sloughs of the region. They are found feeding everywhere in pastures and fields and are almost confiding in nature. Many were caught by Professor Kubichek while he sat in his blind waiting for Western Grebes to perform. The birds would sit on the corner posts of the blind, and by cutting a slit in the burlap and quickly thrusting up a hand, the birds could be grasped by the legs.

RED-WINGED BLACKBIRD. *Agelaius phoeniceus.**○ The Red-winged Blackbird is also a common summer resident about Fort Sisseton.

ORCHARD ORIOLE. *Icterus spurius.**○ This fine songster is a regular summer resident in this area and is another of the birds which has increased in numbers due to planting of trees about farms and towns.

BALTIMORE ORIOLE. *Icterus galbula.**○ The Baltimore Oriole is not uncommon over the entire region and has increased greatly in numbers due to the settlement of the country.

RUSTY BLACKBIRD. *Euphagus carolinus.* A common migrant, not mentioned by Dr. McChesney in his report.

BREWER'S BLACKBIRD. *Euphagus cyanocephalus.*○ This most interesting blackbird has come into the Fort Sisseton country in recent years, as it was not found by Dr. McChesney. It has recently been found nesting in small numbers in favored localities and specimens have been taken.

BRONZED GRACKLE. *Quiscalus quiscula.**○ Dr. McChesney puts this species down as the Purple Grackle. The grackle has also increased in numbers in recent years.

COWBIRD. *Molothrus ater.**○ This foister of the bird family is still a very common species about Fort Sisseton.

CARDINAL. *Richmondena cardinalis.**○ Many birds have expanded or contracted their breeding ranges in recent years, viz., Brewer's Blackbird, Arkansas Kingbird, and others. Most people in the upper Missouri Valley, however, think that the Cardinal is a recent addition to the fauna of the region. This is hardly the case, for Dr. McChesney found this bird on several occasions in the woods about Fort Sisseton, back in 1877, and although he called it casual, it meant that the species was present more than fifty years ago.

ROSE-BREASTED GROSBEAK. *Hedymeles ludovicianus.**○ The strikingly attired male grosbeak is a welcome addition to the bird life of the Coteau. From my observations, however, it is found only in small numbers and is not increasing in abundance.

INDIGO BUNTING. *Passerina cyanea.**○ Another bird with a tropical touch is the Indigo Bunting, which is found in small numbers.

LAZULI BUNTING. *Passerina amoena.* Every day during the first week of June, 1935, the writer found Lazuli Buntings near the camp on Hildebrandt's Lake. The birds were apparently beginning nidification. The presence of this species in the Fort Sisseton region indicates the eastward movement of another western species.

DICKCISSEL. *Spiza americana.**○ Dr. McChesney found the Black-throated Bunting in considerable numbers during the summer time. In recent years it has not been very noticeable around that region, but this is probably due to the fact that it is another species like the Lark Bunting, which seems to fluctuate at intervals as to abundance.

PINE GROSBEAK. *Pinicola enucleator.** In Dr. McChesney's long list this species was merely mentioned. But later he reported (*Bull. Nutt. Ornith. Club*, IV, 1879, p. 187) encountering a flock of "perhaps twenty-five birds" on January 6, 1879, in some timber growth. A single specimen was secured.

REDPOLL. *Acanthis linaria.** This species was also merely mentioned by Dr. McChesney in his first report. But he gave the details in a later note (*Bull. Nutt. Ornith. Club*, IV, 1879, p. 187). During the winter of 1878-79 many flocks were seen, and a specimen was secured on January 28. Mr. Lundquist found this species to be common during the winter of 1931-32.

PINE SISKIN. *Spinus pinus.* The very erratic little Pine Finch is found at odd times in the Fort Sisseton country; it was not mentioned by Dr. McChesney.

GOLDFINCH. *Spinus tristis.**○ The Goldfinch is a common bird and often comes into the town gardens to drink and bathe in a conveniently placed bird bath.

TOWHEE. *Pipilo erythrophthalmus.* A migrant and I believe that a few stay to nest in the secluded glens on the Coteau.

ARCTIC TOWHEE. *Pipilo maculatus arcticus.* This form is also a regular migrant and is found migrating much later in the fall than the preceding form. These two species were not entered by Dr. McChesney.

LARK BUNTING. *Calamospiza melanocorys.**○ The Lark Bunting is here one year and gone the next. In 1929 the birds were not uncommon, but in 1931 only one bird was seen.

SAVANNAH SPARROW. *Passerculus sandwichensis.**○ This prairie sparrow is common all over the Coteau and its thin song is heard on every side. Dr. McChesney did not think it bred in the vicinity, but

the nest of the Savannah Sparrow has been found here and also one hundred miles south of this region.

GRASSHOPPER SPARROW. *Ammodramus savannarum.*° The Grasshopper Sparrow, which has less of a song than the preceding bird was overlooked by Dr. McChesney. It is common and can be found most everywhere.

SHARP-TAILED SPARROW. *Ammospiza caudacuta.*° A very elusive bird which was not reported by Dr. McChesney. A male bird was collected by the writer at Rush Lake on June 7, 1931, and was without a doubt a breeding bird. The Sharp-tailed Sparrow of this region is also called the Nelson's Sparrow.

VESPER SPARROW. *Pooecetes gramineus.**° A common summer bird at present and reported by McChesney during the winter of 1877-78.

LARK SPARROW. *Chondestes grammacus.*° The Lark Sparrow is not a common bird in this region. It was not given in Dr. McChesney's list.

SLATE-COLORED JUNCO. *Junco hyemalis.** The junco was found as a regular winter visitor by Dr. McChesney.

TREE SPARROW. *Spizella arborea.** Dr. McChesney tells of the abundance of this sparrow and considers it a breeding bird. I think he must have confused it with the Chipping Sparrow, as the Tree Sparrow has never been known to nest either in North Dakota or Minnesota, where it would be more apt to nest than in South Dakota.

CHIPPING SPARROW. *Spizella passerina.*° An uncommon summer resident.

CLAY-COLORED SPARROW. *Spizella pallida.**° Dr. McChesney said that this sparrow was extremely rare in 1878. The writer has found this most interesting sparrow not uncommon in many places on the Coteau. Scattered patches of snowberry seem to be its favorite nesting place. The male usually seeks some small tree nearby for his singing periods. Most of the dainty nests were found within a few inches of the ground. Occasionally a nest would be up a foot or two in some small bush.

HARRIS'S SPARROW. *Zonotrichia querula.** One of our most handsome sparrows and a common migrant over the Coteau. Dr. McChesney called it an accidental bird, but in recent years it has been found as common, especially during September and October.

WHITE-CROWNED SPARROW. *Zonotrichia leucophrys.* This species was not mentioned by Dr. McChesney. This bird along with Gambel's Sparrow is a regular migrant at this writing.

WHITE-THROATED SPARROW. *Zonotrichia albicollis.* This crown sparrow was not given by Dr. McChesney in his list. It is now found as a common spring and fall migrant.

FOX SPARROW. *Passerella iliaca.* The large Fox Sparrow is a migrant in small numbers in the Fort Sisseton region. Dr. McChesney did not report this species.

LINCOLN'S SPARROW. *Melospiza lincolni.* A rather silent migrant during its stay with us and although usually common, it is often not seen because of its shyness. Not given by Dr. McChesney.

SWAMP SPARROW. *Melospiza georgiana.**○ Dr. McChesney collected a single bird in the spring of 1878. This sparrow is a regular migrant and the writer is inclined to believe that a few remain to nest, as he has found birds nesting in western Minnesota in similar habitat as offered by the Fort Sisseton region.

SONG SPARROW. *Melospiza melodia.**○ As in the case of the Savannah Sparrow, this sparrow was also considered as a migrant by Dr. McChesney, but now the two species are both found as breeding birds. The long wooded island in Rush Lake was found to be the home of more than one pair of Song Sparrows during the writer's trips to that spot.

LAPLAND LONGSPUR. *Calcarius lapponicus.** This migrating longspur was found by Dr. McChesney as abundant. The bird still comes in large numbers and is observed occasionally in the fall in flocks of thousands.

SMITH'S LONGSPUR. *Calcarius pictus.** Dr. McChesney saw great flocks of these birds in the fall. He adds that for a period of about two hours, he estimated that one thousand birds passed him per minute and that when he left the birds were still flying southward. This species has suffered a tremendous loss in numbers if present day observations are accurate. There are no recent reports of the species from the Fort Sisseton country and very meager reports from Minnesota in the last twenty years. Mr. Chas. J. Spiker's report of Smith's Longspurs in "Winter Bird Records, 1922 to 1926, in Northwestern Iowa" (*Proceedings of the Iowa Academy of Science*, XXXIII, 1926, pp. 307-313), seems to be the only recent record of the birds in this region.

CHESTNUT-COLLARED LONGSPUR. *Calcarius ornatus.**○ This well marked species was considered as merely a migrant by Dr. McChesney, who found it in large numbers. At the present time this longspur is a regular breeding bird on the prairies of northeastern South Dakota.

SIOUX CITY, IOWA.

GENERAL NOTES

Conducted by M. H. Swenk

A Three-egg Set of the Mourning Dove.—On June 5, 1934, in Woodbury Township, Stutsman County, North Dakota, I found the nest of a Mourning Dove (*Zenaidura macroura*) which contained three eggs. Perhaps this is unusual enough to be worth recording.—ARCHIBALD JOHNSON, *Stewart, Nev.*

Effect of Drouth on Birds.—In Woodbury Township, Stutsman County, North Dakota, on June 5, 1934, I found the nest of a Robin (*Turdus migratorius*) which lacked the usual mud walls. The materials used were grasses and fine plant fiber only. On the side that was habitually approached by the birds the nest wall was very much depressed, giving the structure an unsymmetrical appearance. The protracted drouth in the region was no doubt responsible for this deviation from the normal in the construction of this nest.—ARCHIBALD JOHNSON, *Stewart, Nev.*

The Black Tern Recorded in the West Virginia Panhandle.—On May 5, 1935, the writer saw a Black Tern (*Chlidonias nigra* subsp.) at Beech Bottom Swamp, Beech Bottom, West Virginia. The bird was darting after insects just above the water's edge, and came so close to the observer that its black head, throat, breast, and belly were easily discerned. The slate-colored back, wings, and tail were also noted. This is the first record of this species for the West Virginia Panhandle, and there are probably not more than a dozen records of the Black Tern for the state of West Virginia.—THOS. E. SHIELDS, *Wheeling, W. Va.*

Specimen of European Widgeon Taken in Northwestern Iowa.—A fully plumaged male European Widgeon (*Mareca penelope*) was killed during October, 1933, by George Van Wyngarden while he was hunting ducks at North Twin Lakes, Calhoun County, Iowa. Mr. Van Wyngarden stated that this bird was one of a flock of four which flew over, and all appeared to be the same species. Only one specimen was secured.

The specimen was mounted by Mr. Van Wyngarden and is displayed in his private collection of water birds and upland game birds at Manson. While the European Widgeon has been taken in all states surrounding Iowa, this is believed to be the first and only specimen of this bird secured in Iowa. This collection was examined by the writer on May 2, 1935, when permission was kindly granted for the publication of this note.—PHILIP A. DUMONT, *Des Moines, Iowa.*

The Brewer's Blackbird at Athens, Clarke County, Georgia.—In a recent issue of the WILSON BULLETIN (Vol. XLV, No. 3, September, 1933), I discussed in more or less detail the present status of Brewer's Blackbird (*Euphagus cyanocephalus*) as a migrant and winter resident in the southeastern states, and advanced the opinion, based on the relative abundance of this species both in the spring and in the fall at Asheville, North Carolina, that this western bird would prove, despite lack of records to date, to be of regular occurrence in Georgia in migration and possibly throughout the winter. It would appear now that this supposition was at least partially justified for on two brief field trips to Athens, the Brewer's Blackbird was noted on each occasion, and it is probable that others were present before and after these actual dates. On December 3, 1933, three birds, all males, were seen at the edge of the open Sandy Creek bottoms, while on April 9, 1935, four birds, three males and a female, were watched as they fed about horses grazing in a pasture on the

campus of the Agricultural College. On this latter date their similarity to Cowbirds was quite marked, and suggested a very probable reason for their being overlooked in past years. Their habits are certainly very dissimilar to those of the closely related Rusty Blackbird (*Euphagus carolinus*), and this fact should be borne in mind in watching for these birds in migration. Lack of suspicion is another trait characteristic of the small flocks seen in western North Carolina and Georgia, so positive identification is never a difficult matter.—Thos. D. Burleigh, *Bureau of Biological Survey, New Orleans, La.*

A Record of the Trumpeter Swan from the Late Pleistocene of Illinois.—In material secured at Aurora, Illinois, by Professor Clarence R. Smith of Aurora College, forwarded to me for examination by Dr. L. A. Adams of the University of Illinois, I have identified humeri, a broken sternum, and part of the scapula of the Trumpeter Swan (*Cygnus buccinator*). According to Professor Smith[1] these specimens were found in a marl deposit underlying a peat bog above which was a layer of muck forming the bottom of a swamp in Phillip's Park in the southwest part of Aurora at a point a mile and a half east of the Fox River. They were obtained by C. W. A. workers during excavation of the swamp to make an artificial lake.

The swan remains were associated with bones of mastodon (*Mastodon americanus*) and giant beaver (*Castoroides ohioensis*) and are believed to have been deposited in the bed of a post-glacial lake. According to the findings of Dr. O. P. Hay[2] this would seem to place them in what Dr. Hay has termed the Wabash beds in late Pleistocene. Dr. Adams writes me that mollusks of Pleistocene species were taken from the pneumatic foramina of the swan humeri.

The bones are distinguished at a glance as those of the Trumpeter Swan. The sternum, while in fragments, shows the characteristic bulbous swelling projecting into the body cavity at the anterior end in addition to the swollen channel in which the trachea is folded. The humeri exhibit two sizes, possibly indicative of sexual difference in wing measurement, and are greater in size than the largest Whistling Swans. All of the specimens, which bear numbers 111, 734, B, C, D, F, H, J, and K, are fresh and clean in appearance, and are in good state of preservation.

Previously this swan has been reported from Pleistocene deposits in Oregon and Florida, the present being the first occurrence of it in the central portion of our country. The find is one of definite importance in view of the few reports of birds that have come from Pleistocene beds of the area in question.

The specimens have been returned to Professor Smith, to whose kindness and that of Dr. Adams I am indebted for permission to place this occurrence on record, and are preserved by the city of Aurora in a museum at Phillip's Park.—Alexander Wetmore, *U. S. National Museum, Washington, D. C.*

Notes on the Nesting of Captive Mute Swans.—In the latter part of June, 1930, four Mute Swans (*Cygnus olor*) about a year old, and still in the gray juvenile plumage, were placed upon eighty-seven acre Fowler Lake, in the city of Oconomowoc, Waukesha County, Wisconsin. These birds were a single brood from a captive pair. Two additional birds that had been hatched the previous year, but from another pair, were placed on the lake later in

[1]Science, Vol. 81, April 19, 1935, p. 380.
[2]Carnegie Inst. Washington, Publ. 322, 1923, p. 13.

the summer. The four original birds stayed by themselves on the lake, and would not allow the other two to come near them, but pursued them whenever they could get near them. All birds were wing-clipped at the time, but were pinioned before being taken to winter quarters.

The following spring two of the original four birds mated and started building a nest during the latter part of April. The site chosen was in a cattail marsh in the Oconomowoc River, where the stream flows into Fowler Lake. It could easily be seen from a bridge, and as a number of people came to observe the building operations, the pair abandoned this site and moved to a more secluded spot farther up stream. On June 8, 1931, the pair was seen on the lake with five newly hatched young, which must have been less than twenty-four hours old.

The Mute Swan is ordinarily supposed not to mate before three years of age, but this pair was approximately two years of age at the time of producing young.—William Johnston Howard, *Petoskey, Mich.*

The 1934 Fall Migration at Cleveland's Public Square.—Migrating birds were much less common at the Square this season than most years, according to my observations. The only reason that I can propose is that, with the unusual amount of clear weather which occurred during the fall months, migrants were flying higher over Lake Erie on their southward journey, and passed over the city before descending to rest in more attractive surroundings beyond the congested area.

My records for the ten species which I observed this season are as follows:

Species	First Record	Last Record	No. Days Seen	Largest No. in One Day
Canada Goose	Nov. 1	———	1	8
Sparrow Hawk	Sept. 13	Dec. 20	4	1
Herring Gull	Sept. 17	Dec. 17	11	9
Mourning Dove	Aug. 23	———	1	1
Northern Yellow-throat	Sept. 19	Oct. 22	2	1
White-crowned Sparrow	Sept. 19	Oct. 27	2	1
White-throated Sparrow	Oct. 2	Nov. 7	19	3
Song Sparrow	Oct. 10	Oct. 15	2	1
Swamp Sparrow	Oct. 8	———	1	1
Lincoln Sparrow	Sept. 18	Sept. 19	2	1

In addition, evening newspapers carried a story on October 2 that an American Bittern (identified by a qualified ornithologist) had been captured alive in the Square that morning. The geese and the Mourning Dove, the only new additions to my list, were observed flying over at a low altitude.

Starlings were as numerous as ever. This year they took over the terminal tower as one of their roosting spots, many of them finding crannies five or six hundred feet above the street, where a strong wind is blowing much of the time. This must have been a miserable roost in severe weather, but it seemed to make little difference.—William H. Watterson, *Cleveland, Ohio.*

Some Corrections.—I should like to make the following corrections to my article on Walter John Hoxie in the Wilson Bulletin, XLVI, September, 1934: On page 173, in the map of the Sea Islands, "Hunters Island" should read Hunting Island. On page 174, last line, the date should read July 2, 1906. On page 176, line 17, it was a mistake to say that "Later observations have confirmed Hoxie's records" of the Buff-breasted Sandpiper. Hoxie's notes indicate one was taken on St. Helena Island, South Carolina, on May 5, 1886, but thus far the whereabouts of the specimen is unknown. Among Hoxie's

papers is a letter to him from Arthur T. Wayne, dated June 25, 1908, in which Mr. Wayne writes: ". . . Mr. W. W. Worthington . . . mentioned that you had taken a Buff-breasted Sandpiper on St. Helena Island and that he had seen and identified it as a bird of that species. . . . Please let me know to whom you sold it." In 1934 neither Mr. Hoxie nor Mr. Worthington could give any definite information leading to what disposition was made of the specimen. There appear to be no authentic records of this bird in the spring on the South Atlantic coast. My attention was called to this error relative to the Buff-breasted Sandpiper by Messrs. Alexander Sprunt, Jr., and Edward von S. Dingle.—Wm. G. Fargo, *Jackson, Mich.*

The Savannah Sparrow in Maryland.—I was much interested in the article by Thomas E. Shields on the Savannah Sparrow in West Virginia in the March, 1935, number of the Wilson Bulletin (pp. 35-42). Since there is no reference to Maryland in the article in question, I wonder whether the writer overlooked my records of the species from the adjoining county of Garrett in western Maryland. On page 438 of the 1909 volume of the *Auk*, *P. sandwichensis* is reported from Mount Lake Park, near Oakland, territory essentially of the same nature as at Terra Alta. Again, on page 599 of the 1920 volume of the same journal it is reported from Accident, Garret County, twenty miles north of Oakland, where it was rather common that summer. They, no doubt, had been nesting. Under date of July 17, 1920, I have this remark in my notes: "A Savannah is still singing in Boyer's pasture." I did not look for nests—with such a wealth of interesting material and so many fine spots to go to, I did not take much time off to look for nests, excepting such as were easy to find. However, a boy brought me a nest from the same pasture earlier in the season, which I took to be one of the species in question. It certainly was not a nest of the Song Sparrow or of the Vesper Sparrow, the only other ones that could have come into consideration. We replaced the nest, but I failed to note in my book what became of it.—C. W. G. Eifrig, *River Forest, Ill.*

Chuck-wills-widow Collected in Southeastern Iowa.—On November 12, 1934, Wm. L. Talbot of Keokuk, Iowa, wrote that on June 17, 1933, while visiting on a farm on Sugar Creek, seven miles from the mouth of the Des Moines River in Lee County, the owner called attention to a peculiar type of "Whip-poor-will call" which he had heard for the preceding few evenings. After Talbot had heard the song, and upon his suggestion, the bird was collected.

The specimen was satisfactorily identified by the late Dr. C. E. Ehinger, of Keokuk, and Talbot as the Chuck-wills-widow (*Antrostomus carolinensis*). Notes made by Dr. Ehinger at the time were as follows: "The measurements corresponded to those in Forbush's 'Birds of Massachusetts and Other New England States.' The identification was made more certain by the presence of lateral filaments on the bristly feathers on the side of the mouth. A Whip-poor-will was heard singing along the bluff at the same time as the Chuck-wills-widow and there was very little similarity in the voices." Unfortunately, the specimen was too badly shot to be preserved as a skin.

This is believed to be the first Iowa occurrence of this southern species, although it breeds in southern Missouri and southern Illinois.—Philip A. DuMont, *Des Moines, Iowa.*

An Old Record of the Brown-headed Nuthatch in Iowa and Illinois.—In a letter from Ed. S. Currier of Portland, Oregon, on November 27, 1934, he related having found the Brown-headed Nuthatch (*Sitta pusilla pusilla*) at Keokuk, Iowa. Currier wrote as follows:

"I cannot find where the Brown-headed Nuthatch has ever been recorded from Iowa and therefore I will report an unusual flight or visit of these birds to Keokuk during May, 1893. On May 9 early in the morning I saw one in town and in the afternoon, while out of town a few miles, I saw five others. I shot two of them but the shot were too large and mutilated them so they could not be made into skins. On May 10 I saw three more in town during the early morning. On May 12 two were seen in Hancock County, Illinois, across from Keokuk. Two were seen in Keokuk on May 13. These are my only Iowa observations."

Due to the repeated opportunity which Currier apparently had to observe these birds and the added verification of specimens having been collected, I see no reason why this species should not be recognized on the Iowa bird list. These records of Currier's are believed to constitute the only known Iowa occurrence of this species. It is a rare permanent resident in southern Missouri and has occurred casually in Ohio and New York.—PHILIP A. DUMONT, *Des Moines, Iowa.*

The Effect of Certain Relief Projects on Bird Life.—During the last few years newspaper readers have been surfeited with items concerning relief and the expenditure of relief funds. Great stress has been laid upon projects which would give employment to the greatest number of men. One of the favorites, since it required no planning or trained supervision, was the cleaning of streams and ditches. On the other hand practically nothing has been written on the effect of these "clean-up" projects upon wild life. True, many general statements have been made, but no definite reports based upon actual research work have appeared. With a view of supplying this need even though in a small way, the following data are presented.

The area considered is about one-half mile of the Swan Creek Valley bordering the Toledo State Hospital grounds at the southwest boundary of Toledo, Ohio. The valley is fifty feet deep and averages five hundred feet in width. Although small in size, this area in the year 1931 contained several distinct habitats; one group of large trees and a few scattered throughout the section, two apple orchards, a few open prairie-like stretches, and several places covered with small trees and shrubbery with the usual briar and grapevine tangles. The creek itself was in a natural state, shaded by willows and sycamores, and typical sandbars, fallen-tree dams, and patches of water willow. The following year the first of the "clean-up" work was begun. The city of Toledo employed quite a number of men on relief landscaping the creek valleys about the city. This meant the cutting down of shrubs and dead trees, the thinning out of saplings, and the removal of practically all grapevines and briars. Nesting birds began to suffer.

In 1933 came the great C. W. A. army which finished the work of the city relief corps, removing any chance shrub which may have escaped, leveling the willows and sycamores at the stream's edge, and cutting down the banks at a steep slope. Swan Creek was transformed into a drainage canal.

It is not the purpose of this article to criticize this relief work or enter into the motives which prompted the "clean-up" campaign. Our wish is to bring home the great disaster which was brought upon our nesting birds. The follow-

ing tabulation brings this out forcibly. As these records are based upon several hours' work each day throughout the nesting season, they are probably as accurate as possible. When nests were not actually found, a singing male during the breeding season was recorded as a pair.

Pairs of nesting birds in a half-mile stretch of the valley of Swan Creek along the State Hospital grounds for the years 1931, 1933, and 1934:

Species	1931	1933	1934
Bob-white	2	0	0
Spotted Sandpiper	1	1	0
Mourning Dove	Common	Common	2
Yellow-billed Cuckoo	3	0	0
Screech Owl	0	1	0
Belted Kingfisher	1	1	1
Red-headed Woodpecker	8	2	0
Flicker	Common	6	1
Alder Flycatcher	4	4	0
Crested Flycatcher	1	0	0
Eastern Kingbird	1	0	0
Wood Pewee	2	0	0
Phoebe	1	2	1
Rough-winged Swallow	1	1	1
Blue Jay	3	3	0
Carolina Wren	1	0	0
House Wren	6	2	1
Catbird	3	0	0
Brown Thrasher	6	3	0
Bluebird	2	0	0
Robin	Common	Common	2
Wood Thrush	3	0	0
Starling	6	10	4
Yellow Warbler	Common	6	1
Northern Yellow-throat	2	2	0
Bronzed Grackle	5	4	0
Baltimore Oriole	4	3	1
Indigo Bunting	2	1	0
Cardinal	4	3	0
Rose-breasted Grosbeak	1	0	0
Song Sparrow	Common	2	2
Goldfinch	4	2	0

If a minimum of ten nests is substituted for species marked "Common", we find a total of 127 for 1931, 78 for 1933, and 17 for 1934. In terms of percentage, this means a drop of 87 per cent in the number of nesting birds which can be accounted for only by the "clean-up" work. Multiply this decrease in numbers by ten since at least five miles of creek valley were denuded, and we arrive at some idea of the terrific loss of bird population along this stream.

Where did these missing birds go? A similar check during these years of the upland groves and fields of the Toledo State Hospital grounds shows that the number of birds there remained fairly constant. Only two species appear to have come up from the lowlands in 1934—namely, a Bob-white which nested in a currant patch, and a Spotted Sandpiper which, finding its usual sandbar removed, raised its young in the garden. An increase also was shown by Goldfinches, some of which may have come from the creek valley. But most of the missing birds seem to have vanished completely.—Araminta A. Brandenburg and Louis W. Campbell, *Toledo, Ohio.*

EDITORIAL

THE TWENTY-FIRST ANNUAL MEETING of the Wilson Ornithological Club will be held in St. Louis on December 30 and 31 of this year. Details can not be announced at this time, but they will be given in the Secretary's letter to all members in October. This meeting will be held in conjunction with the general sessions of the American Association for the Advancement of Science. Our only previous meeting in St. Louis was held in 1919. Mr. A. F. Satterthwait will act as Chairman of our Local Committee, others members being named later.

DR. EMIL WITSCHI's paper in this issue is another example of one of the new experimental methods of investigation in ornithology. His results indicate that the hypophysis, through its internal secretions, exercises a controlling effect on the reproductive cycle. To what extent other activities, migration for instance, are dependent upon the reproductive cycle is not yet determined. Likewise, just what regulates and controls the activity of the hypophyseal gland is unknown. Dr. Witschi also shows that the seasonal changes in plumage pattern of the male are controlled by gonadotropic hormones, but not in the female, at least in weaver finches. This experimental field affords the opportunity to re-examine many of the old ornithological ideas in the light of the new science of endocrinology; for example the phenomena of migration, molting period and sequence, feather pattern and plumage pattern, nest building, egg laying, and all the urges connected therewith. It is a search for causes, and is physiological.

DR. ALEXANDER WETMORE, of the United States National Museum, informs us that the next (Ninth) International Ornithological Congress will be held at Rouen, France, between the 1st and 15th of May, 1938. This is ample enough notice to enable those interested to plan for the occasion. It would seem to us, however, that the date is about a month too early for much of a delegation from this country.

In reading a biography of Dr. Edward Jenner, discoverer of vaccination for smallpox, we learned that he was a naturalist and lover of birds. The poem reproduced on the cover page of this issue was written by him at the age of twenty-one.

The article on the birds of the Fort Sisseton Region in this issue is published with the aid of a subsidy.

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MEMBERSHIP ROLL OF THE WILSON ORNITHOLOGICAL CLUB*

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*This is a complete membership roll of the Wilson Ornithological Club according to present records. If any names are omitted it has been from oversight. All members are urged to notify the Secretary of any errors in spelling, titles, dates, or address. Please notify us promptly when address changes are made. Errors in address cost in money and inconvenience.

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Cook, G. M., 2301 Elm St., Youngstown, Ohio....1923
Coryell, Sherman, 1500 Hood Ave., Chicago, Illinois....1920
Cottam, Clarence, U. S. Dept. Agr., Biological Survey, Washington, D. C....1929
Dakan, Prof. E. L., Poultry Dept., Ohio State University, Columbus, Ohio....1932
Danforth, Prof. Stuart T., Mayaguez, Porto Rico....1924
Dawson, Sallie, 807 N. 4th St., Terre Haute, Indiana....1933
DeLury, Dr. Ralph E., Dominion Observatory, Ottawa, Ontario....1920
Dickinson, F. R., 1518 Astor St., Chicago, Illinois....1931
Dodge, Thomas H., P. O. Box 169, Gallup, New Mexico....1933
Douglass, Donald W., Dept. Biol., Texas Teachers College, Lubbock, Texas....1929
DuMont, Philip A., 306 51st St., Des Moines, Iowa....1928
Eaton, Warren F., 128 Wildroot Ave., Upper Montclair, New Jersey....1932
Eifrig, C. W. G., 1029 Monroe Ave., River Forest, Illinois....1907
Ekblaw, Dr. George E., 506 W. Main St., Urbana, Illinois....1914
Ekblaw, Prof. W. Elmer, Clark University, Worcester, Massachusetts....1910
Emilio, S. Gilbert, 7 Winter St., Salem, Massachusetts....1929
English, Dr. P. F., Game Division, Dept. of Conservation, Lansing, Michigan....1934
Errington, Dr. Paul L., Iowa State College, Ames, Iowa....1932
Esten, Sidney R., 4112 Graceland Ave., Indianapolis, Indiana....1931
Fleming, James Henry, 267 Rusholme Road, Toronto 4, Ontario....1906
Floyd, Judge Joseph L., 1009-11 Geo. D. Harter Bank Bldg., Canton, Ohio....1903
Freer, Prof. Ruskin S., Lynchburg College, Lynchburg, Virginia....1930
Friedmann, Dr. Herbert, U. S. National Museum, Washington, D. C....1932
Gabrielson, Ira N., U. S. Biological Survey, Washington, D. C....1913
Gault, Benjamin True, 570 Anthony St., Glen Ellyn, Du Page Co., Illinois....1895
Gorski, Arthur J., Route 2, Box 143, Merrill, Wisconsin....1933
Grinnell, Dr. Joseph, Museum of Vertebrate Zoology, University of California, Berkeley, California....1914
Guest, Marjorie Lee, Athens State Hospital, Athens, Ohio....1924
Hand, Ralph L., 428 11th St., St. Maries, Idaho....1933
Handlan, John W., Oglebay Park, Wheeling, West Virginia....1932
Handlan, J. T. Jr., 480 Spruce St., Morgantown, West Virginia....1934
Hankinson, Prof. T. L., 96 Oakwood Ave., Ypsilanti, Michigan....1911
Helmuth, Dr. William T., 667 Madison Ave., New York City....1934
Henderson, Prof. Junius, 1305 Euclid Ave., Boulder, Colorado....1903
Hendrickson, Prof. Geo. O., Iowa State College, Ames, Iowa....1933
Herrick, Dr. Francis H., 2863 Noble Road, Cleveland Heights, Ohio....1917
Himmel, Dr. Walter J., Dept. of Botany, Univ. of Nebraska, Lincoln, Nebr....1915
Hinnen, Dr. G. A., 1343 Delta Ave., Cincinnati, Ohio....1934
Hinshaw, Thomas D., 1908 Scottwood Ave., Ann Arbor, Michigan....1926
Holt, Ernest G., U. S. Soil Conservation Service, La Crosse, Wisconsin....1926
Jenner, William, 806 W. Davis St., Fayette, Missouri....1933
Johnson, Dr. Charles E., Roosevelt Wild Life Station, New York State College of Forestry, Syracuse, New York....1933
Jung, Clarence S., 4612 N. Oakland Ave., Milwaukee, Wisconsin....1921
Kelso, Leon, Food Habits Research, U. S. Biol. Survey, Washington, D. C....1930
Kendeigh, Dr. S. Charles, Biological Laboratory, Western Reserve University, Cleveland, Ohio....1923
Kirn, Albert J., Box 157, Somerset, Texas....1918
Kretzmann, Dr. Paul E., 801 DeMun Ave., St. Louis, Missouri....1924
Larrabee, Prof. Austin P., Yankton College, Yankton, South Dakota....1921
Laskey, Mrs. F. C., Graybar Lane, Nashville, Tennessee....1928
Leopold, Prof. Aldo, New Soils Bldg., Univ. of Wisconsin, Madison, Wisc....1928

Lewis, John B., Amelia, Virginia....1924
Lewy, Dr. Alfred, 2051 E. 72nd Place, Windsor Park, Chicago, Illinois....1915
Lowe, Dr. John N., Northern State Teachers College, Marquette, Michigan....1927
MacCracken, Dr. W. H., Detroit College of Medicine and Surgery, 1516 St. Antoine St., Detroit, Michigan....1933
Magann, J. Wilbur, Oklahoma Gas and Electric Co., Oklahoma City, Okla....1927
Maillaird, Joseph, 1815 Vallijo St., San Francisco, California....1930
McAtee, W. L., U. S. Biological Survey, Washington, D. C....1911
McCabe, T. T., Museum of Vertebrate Zoology, Berkeley, California....1928
McConnell, H. B., Cadiz, Ohio....1935
McCreary, Otto, Agricultural Hall, Univ. of Wyoming, Laramie, Wyoming....1930
McMath, Robert R., Route 4, Pontiac, Michigan....1934
Mershon, William Butts, Saginaw, Michigan....1910
Metcalf, Prof. F. P., Lingnan University, Canton, China....1919
Minich, Edward C., 1047 Fairview Ave., Youngstown, Ohio....1923
Mitchell, Mrs. Osborne S., 24 Wychwood Park, Toronto, Canada....1933
Morse, Harry G., Huron, Ohio....1914
Morse, Margarette E., Box 96, Viroqua, Wisconsin....1921
Moseley, Prof. Edwin L., State College, Bowling Green, Ohio....1925
Moses, Charles W., 216 Park St., West, Bismarck, North Dakota....1935
Mote, G. A., Marshalltown, Iowa....1930
Munger, Mrs. Edith, Hart, Michigan....1925
Neff, Johnson A., Bur. of Biol. Survey, 270 Federal Bldg., Sacramento, Calif....1920
Nice, Dr. Leonard B., 156 W. Patterson Ave., Columbus, Ohio....1932
Nice, Mrs. Margaret M., 156 W. Patterson Ave., Columbus, Ohio....1921
Nichols, Charles K., 31 Ethelbert Place, Ridgewood, New Jersey....1933
Northcutt, Charles E., 7 West Blvd., Columbia, Missouri....1930
Oberholser, Dr. Harry C., 2805 18th St., N. W., Washington, D. C....1894
Olsen, Humphrey A., Nashville Agr. Normal Inst., Madison, Tennessee....1932
Osgood, Dr. Wilfred H., Field Museum of Natural History, Chicago, Illinois....1910
Over, Prof. William H., University Museum, Vermillion, South Dakota....1930
Palmgren, Dr. Pontius, Museum Zoologicum Universitatis, Helsenki, Suomi, Helsingfors, Finland....1935
Palmer, Dr. Theodore S., 1939 Biltmore St. N. W., Washington, D. C....1914
Parker, Herbert, South Lancaster, Massachusetts....1928
Pemberton, John Ray, 3031 N. Lake Ave., Altadena, California....1922
Pennock, Charles John, Kennett Square, Chester Co., Pennsylvania....1900
Perkins, Samuel E. III, 709 Inland Bldg., Indianapolis, Indiana....1923
Pettingill, Dr. Olin S., Maple St., Middleton, Massachusetts....1930
Phelps, Frank M., 312 5th St., Elyria, Ohio....1912
Phillips, Allan R., P. O. Box 357, Scarsdale, New York....1934
Pickwell, Prof. Gayle B., Dept. Natural Science, San Jose State Teacher's College, San Jose, California....1923
Porter, James V., 226 E. Minnesota Ave., Glenwood, Minnesota....1928
Praeger, Prof. William E., 417 Douglas Ave., Kalamazoo, Michigan....1916
Preble, Edward A., U. S. Biological Survey, Washington, D. C....1929
Quillian, Prof. Marvin C., Wesleyan College, Macon, Georgia....1927
Randall, Mrs. W. S., No. 2, Enfield Road, Austin, Texas....1925
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Rogers, Mrs. Walter E., 911 East North St., Appleton, Wisconsin....1931
Rosene, Walter M., Ogden, Iowa....1923
Rust, Harry J., Box 683, Couer d'Alene, Idaho....1921
Satterthwait, Elizabeth A., 118 Waverly Place, Webster Groves, Missouri....1925
Saunders, W. E., 352 Clarence St., London, Ontario....1902
Saur, B. C., Rockwell Nursery, Foster, Ohio....1934
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Schantz, O. M., 3219 Maple Ave., Berwyn, Illinois....1903
Schmidt, F. J. W., 2 New Soils Bldg., Univ. of Wisconsin, Madison, Wisc....1934
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Shaffer, Chester M., Dorcas, West Virginia....1934

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Skinner, M. P., 1316 Harding St., Long Beach, California....1926
Smith, Prof. Frank M., 79 Fayette St., Hillsdale, Michigan....1910
Smith, Frank R., Fredericktown, Pennsylvania....1930
Smith, Malcolm M., 327 Ashbourne Road, Elkins Park, Pennsylvania....1927
Spiker, Charles J., Branchport, New York....1916
Stebbins, Miss Fannie A., 31 Ely Ave., W. Springfield, Massachusetts....1935
Stillwell, Jerry E., 7523 San Fernando Way, Dallas, Texas....1935
Stoner, Dr. Dayton, New York State Museum, Albany, New York....1912
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Wallace, George E. Jr., McKean, Pennsylvania....1934
Warren, Edward R., 1511 Wood Ave., Colorado Springs, Colorado....1911
Weber, Alois J., 904 Grand Ave., Keokuk, Iowa....1928
Webster, Walter A., Sycamore Lawn Farm, R. D. 1, Quaker City, Ohio....1935
Welds, H. B., 229 42nd St., Sandusky, Ohio....1930
Wetherill, Milton, Kayenta, Arizona....1935
Wetmore, Dr. Alexander, U. S. National Museum, Washington, D. C....1903
Weydemeyer, Winton, Fortine, Montana....1930
Wheeler, Leslie, Lake Forest, Illinois....1934
White, Francis Beach, St. Paul's School, Concord, New Hampshire....1926
Wilson, Frank N., 804 Lawrence St., Ann Arbor, Michigan....1924
Wilson, Prof. Gordon, 1434 Chestnut St., Bowling Green, Kentucky....1925
Wineman, A., 150 Michigan Ave., Detroit, Michigan....1934
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Yoder, William H. Jr., 859 Granite St., Philadelphia, Pennsylvania....1926
Zimmerman, Harold A., 915 W. Gilbert St., Muncie, Indiana....1932

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Allen, A. F., 108 Terrace Apartments, Sioux City, Iowa....1925
Allen, Walter I., 2057 Pepper Drive, Altadena, California....1934
Allert, Oscar P., R. R. 1, McGregor, Iowa....1923
Amandon, Dean, R. D. 1, Franklinville, New York....1935
Ammann, George Andrew, Museum of Zoology, Ann Arbor, Michigan....1935
Angus, H. L., 617 Payson Ave., Quincy, Illinois....1933
Applegate, Wilson, Rhinebeck, New York....1935
Austin, Dr. Oliver L., Tuckahoe, Westchester Co., New York....1930
Back, Mary Cooper, 1015 South 12th Ave., Maywood, Illinois....1934
Backofen, Margaret, 76 West Columbia Ave., Battle Creek, Michigan....1934
Badger, T. Hallett, Birds Nest, Virginia....1935
Bailey, Mrs. Florence Merriam, 1834 Kalorama Road, Washington, D. C....1911
Bailey, Mrs. Mary L., 2109 Nebraska St., Sioux City, Iowa....1918
Baker, John H., 1165 5th Ave., New York City....1930
Baker, William C., 223 W. Pershing St., Salem, Ohio....1931
Baldwin, Dorothy A., Hardwick, Massachusetts....1934
Ball, William H., 1861 Ingleside Terrace, N. W., Washington, D. C....1924
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Barnett, Dorothy I., Lucas, Ohio....1933
Bassett, Mrs. V. H., 1010 E. Park Ave., Savannah, Georgia....1931
Batchelder, C. F., 7 Kirkland St., Cambridge, Massachusetts....1927
Beals, Mrs. Marie V., 5833 85th St., Elmhurst, Long Island, New York....1930
Beebe, Ralph, 353 Salliotte St., Ecorse, Michigan....1924
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Bellrose, Frank, Jr., 1220 W. Madison St., Ottawa, Illinois....1935
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Bennett, Logan J., 1818 Arlington Ave., Des Moines, Iowa....1934
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Benson, Seth B., Museum of Vertebrate Zoology, Berkeley, California....1930
Bergner, Harold J., 420 Warwood Ave., Wheeling, West Virginia....1934
Berner, Glen, 121 East Front St., Jamestown, North Dakota....1930
Bicking, Charles A., 1006 W. 8th St., Wilmington, Delaware....1933
Bird, Otto A., 1510 Harding Road, Ann Arbor, Michigan....1932
Birkeland, Henry, Route 2, Nevada, Iowa....1934
Black, Charles T., 3836 Lowell Ave., Chicago, Illinois....1935
Black, J. D., Winslow, Arkansas....1925
Blanchard, Dr. Frank N., Dept. of Zoology, University of Michigan, Ann Arbor, Michigan....1928
Blincoe, Mrs. Benedict J., Route 13, Dayton, Ohio....1926
Bodine, Miss Margaret L., Ritterhouse Plaza, 19th and Walnut St., Philadelphia, Pennsylvania....1930
Boggs, I. B., Oglebay Hall, Morgantown, West Virginia....1933
Book, Dr. R. D., Corning, Ohio....1933
Bordner, Mrs. Robert I., Hudson, Iowa....1930
Borror, Donald J., Dept. of Zoology and Entomology, Ohio State University, Columbus, Ohio....1927
Boulton, Rudyard, Field Museum, Chicago, Illinois....1922
Bowman, Lawrence L., Orchard Hills, R. D. 7, North Canton, Ohio....1935
Brady, Dr. John A., St. Augustine College, Lakewood, Ohio....1925
Braly, John, De Poe Bay, Oregon....1927
Brasher, Rex, Chickadee Valley, Kent, Connecticut....1926
Brant, Irving W., %St. Louis Star, St. Louis, Missouri....1932
Breece, Russell, Delaware, Ohio....1933
Breslau, Leo A., % Laurel Printing Co., 480 Canal St., New York City....1933
Brooks, A. B., Ogelbay Park, Wheeling, West Virginia....1931
Brooks, Maurice, French Creek, West Virginia....1926
Broomhall, W. H., Stockport, Ohio....1926
Brosius, Ralph R., Valentine, Nebraska....1933
Brown, J. Wilcox, White Plains, Montchanin, Delaware....1932
Brown, Ralph M., V. P. I., Blacksburg, Virginia....1935
Brown, Robert B. Jr., 806 Rosewood Ave., Winnetka, Illinois....1935
Bruce, James A., 557 Spring St., Wooster, Ohio....1929
Bujak, B. J., 932 N. Fairfield Ave., Humboldt Park Station, Chicago, Illinois....1935
Bullock, D. J., Commodore Hotel, Des Moines, Iowa....1932
Burt, W. H., Museum of Zoology, Ann Arbor, Michigan....1928
Cain, B. C., Box 796, Oakland, California....1934
Campbell, S. H., Oak Grove, Louisiana....1934
Campbell, John S., Bienville, Louisiana....1932
Campbell, Louis W., 304 Fearing Blvd., Toledo, Ohio....1926
Carlson, Carl Olof, Dept. of Biology, Doane College, Crete, Nebraska....1923
Carpenter, J. Richard, Lincoln College, Oxford University, England....1934
Carter, John D., Lansdowne, Pennsylvania....1930
Cartwright, Bertram William, 238 Guilford St., Deer Lodge, Winnipeg....1930
Case, Rodman C., R. D. 1, Troy, Pennsylvania....1935
Chaffee, H. L., Amenia, North Dakota....1930
Chamberlain, Glen D., 22 Academy St., Presque Isle, Maine....1930
Chapman, Floyd B., 1944 Denune Ave., Columbus, Ohio....1932

Chapman, L. B., 67 Chester St., Newton Highlands, Massachusetts....1934
Chambers, W. Lee, 2068 Escarpa Drive, Eagle Rock, Los Angeles, California..1909
Clapp, Alston, Sr., 1115 Cotton Exchange Bldg., Houston, Texas....1934
Clark, Mrs. C. C., 922 N. Third St., Burlington, Iowa....1925
Clarke, C. H. D., Dept. of Biology, University of Toronto, Toronto, Ontario....1932
Clayton, Miss Luella B., Feasterville, Pennsylvania....1930
Clippinger, Miss Florence, 4300 Midway Ave., Dayton, Ohio....1933
Clout, G. A., 89 North St., St. Catherines, Ontario....1935
Coles, Victor, 2910 Grasselli Ave., Cincinnati, Ohio....1929
Collett, Grace, 37 W. Tulane Road, Columbus, Ohio....1934
Collins, Henry H. Jr., 1620 P. St. N. W., Washington, D. C....1931
Compton, Lawrence V., Museum of Vertebrate Zoology, Berkeley, California..1923
Compton, Leila A., 846 E. Bowman St., Wooster, Ohio....1930
Conant, Roger, Toledo Zoological Society, Toledo, Ohio....1930
Conklin, Charles, Canal Winchester, Ohio....1933
Cook, Mrs. Horace P., 412 W. 11th St., Anderson, Indiana....1931
Cox, Rodman D., 785 South Ave., Rochester, New York....1933
Craig, Gerald S., Teacher's College, Columbia University, New York City....1932
Crandell, Herbert A., Ohio State University, Columbus, Ohio....1934
Crane, Francis V., South St., Needham, Massachusetts....1932
Crook, Compton N. Jr., Tennessee Polytechnical Inst., Cookeville, Tennessee..1929
Curl, A. Lawrence, Quincy, Ohio....1932
Currier, Elmonde S., 8541 N. Chicago Ave., St. Johns Sta., Portland, Oregon..1930
Curtis, John T., 325 Grand Ave., Waukesha, Wisconsin....1935
Curtler, Martin, % Mrs. George P. Cook, Kauluwai, Kaunakai P. O., Malokai, Hawaii....1934
Dambach, Charles A., Burton, Ohio....1934
Damon, David, 717 West St., Rapid City, South Dakota....1933
Danner, Mrs. Mary S., 1646 Cleveland Ave., N. W., Canton, Ohio....1921
Davidson, W. M., R. D. 1, Silver Spring, Maryland....1933
Davis, Mrs. L. Irby, Box 669, Harlington, Texas....1933
Davis, Russel S., Clayton, Illinois....1932
Dawley, Jean Wilson, 13962 Clifton Blvd., Lakewood, Ohio....1931
Dawley, Jessie Sprague, 1002 Garfield St., Madison, Wisconsin....1935
Dawson, Sallie, 807 N. 4th St., Terre Haute, Indiana....1933
Denton, Fred J., Dept. Zoology, University of Georgia, Athens, Georgia....1935
Dille, Fred M., Rapid City, South Dakota....1912
Dingle, Edward von Seibold, Huger, South Carolina....1921
Dole, J. Wilbur, 51 East Stone St., Fairfield, Iowa....1930
Dyer, Mrs. Minnie M., Byington, Tennessee....1930
Eastman, Mrs. E. P., 719 Columbia St., Burlington, Iowa....1926
Eastwood, Sidney K., 301 S. Winebiddle Ave., Pittsburgh, Pennsylvania....1928
Eckler, Harlan E., 1757 Hertel Ave., Buffalo, New York....1933
Edge, Mrs. Charles Noel, 136 E. 67th St., New York City....1931
Edson, J. M., 90 Marietta Road, Bellingham, Washington....1928
Edwards, Mrs. W. H., Fairhope, Alabama....1925
Eheim, J. M., 236 S. Adams St., Hutchinson, Minnesota....1926
Eike, James, P. O. Box 4, Woodbridge, Virginia....1933
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Elrod, Mrs. Walter DeWitt, Box 103, Okmulgee, Oklahoma....1923
Emery, F. H., 620 Euclid Ave., Toronto, Ontario....1933
Engleby, T. L., 1002 Patterson Ave., Roanoke, Virginia....1934
Erickson, Mary M., Museum of Vertebrate Zoology, Berkeley, California....1930
Evans, Dr. Evan M., 550 Park Ave., New York City....1929
Everett, Constance, 206 9th St. N. E., Waseca, Minnesota....1934
Evins, Samuel N., 38 E. 14th St., Atlanta, Georgia....1921
Fabert, Harry John, 413 Linwood Ave., Columbus, Ohio....1932
Farley, Frank L., Camrose, Alberta....1934
Favell, Mrs. Angela Haste, 714 6th Ave. East, Superior, Wisconsin....1934
Feighner, Lena Veta, 298-1 South Tremont, Kansas City, Kansas....1935
Felker, J. O., R. 1, Box 403, Clayton, Missouri....1934

Felton, W. R., 1709 Summit St., Sioux City, Iowa....1934
Ferratt, Miss Elizabeth F., 2310 Connecticut Ave. N. W., Washington, D. C....1933
Foster, George, 2352 E. Magnolia Ave., Knoxville, Tennessee....1935
Finster, Ethel B., Ashville Normal School, Ashville, North Carolina....1930
Fisher, Dr. G. Clyde, American Museum of Natural History, New York City....1925
Fitzpatrick, Prof. Fred L., Teacher's College, Columbia Univ., New York, N. Y....1924
Fleetwood, Raymond J., Great Smoky Mountains National Park, Gatlinburg, Tennessee....1934
Fleming, Mrs. Allen W., 44 Woodland Ave., Columbus, Ohio....1934
Foote, M. E., Norwalk, Ohio....1934
Ford, Louise Pettigrew, Barnwell Ave., Aiken, South Carolina....1930
Forsthoefel, Paul, 303 East Fulton St., Celina, Ohio....1932
Franks, Roscoe W., State Civil Service Commission, Columbus, Ohio....1932
Franzen, Albert J., Field Museum, Chicago, Illinois....1929
Frazer, Dr. T. Atchinson, Marion, Kentucky....1934
Frazier, John M., Station A, Box 156, Hattiesburg, Mississippi....1930
Frothingham, Mrs. Randolph, 56 Sargent Crossway, Brookline, Massachusetts....1932
Frydrych, Paul B., 1508 Valley St., Dayton, Ohio....1934
Fryklund, P. O., Roseau, Roseau Co., Minnesota....1926
Furniss, Owen C., 2203 1st Ave., W. Prince Albert, Sask., Canada....1934
Gander, Frank F., Natural History Museum, Balboa Park, San Diego, Calif....1928
Ghigi, Alessandro, R. Universita, Bologna, Italy....1931
Giles, Norman H. Jr., 959 Drewery St., N. E., Atlanta, Georgia....1930
Gill, Geoffrey, 24 Overlook Drive, Huntington, Long Island, New York....1934
Gillett, Francis C., 920 Princeton St., Lansing, Michigan....1935
Gillette, Fredericka B., 1319 Forest Ave., Ann Arbor, Michigan....1928
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Gordon, Seth, American Game Assoc., Investment Bldg., Washington, D. C....1933
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Grant, Cleveland P., 620 Greenup St., Covington, Kentucky....1928
Grant, William W., 816 S. Main St., Geneva, New York....1933
Gray, Allan L., Orleans, Nebraska....1932
Greene, Earle R., New Holland, North Carolina....1930
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Gresham, Burt, Winnipeg Free Press, Winnipeg, Manitoba....1934
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Gromme, Owen J., Milwaukee Public Museum, Milwaukee, Wisconsin....1924
Gross, Dr. Alfred O., Bowdoin College, Brunswick, Maine....1927
Guy, Mrs. Katherine Christie, Box 416, Beckley, West Virginia....1934
Haberger, Ruth, 401 W. Main, Marshalltown, Iowa....1931
Hagar, Mrs. Jack, Rockport, Texas....1930
Hague, Florence, Sweet Briar College, Sweet Briar, Virginia....1931
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Hale, Arthur T. Jr., Box 753, Mission, Texas....1935
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Hallman, R. C., P. O. Box 847, St. Augustine, Florida....1928
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Handley, Charles O., Richmond, Virginia....1925
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Harkin, J. B., Commissioner Dept. of Interior, Ottawa, Ontario....1924

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Hicks, John N., West Point, Illinois....1935
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Howard, William J., Wilderness State Park, Carp Lake, Michigan....1935
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Hunter, Lawrence E., Dallas City, Illinois....1934
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Johnson, Mrs. Irene W., 38 Portland Place, St. Louis, Missouri....1931
Johnson, Robert A., State Normal School, Oneonta, New York....1930
Jones, F. M., Box 105, Abington, Virginia....1933
Jones, Gordon Willis, Wilderness, Virginia....1933
Jones, Harold C., 352 W. College St., Oberlin, Ohio....1929
Jones, John C., 3224 19th St., N. W., Washington, D. C....1931
Jones, S. Paul, 509 West Ave. N., Waukesha, Wisconsin....1921
Kalmbach, E. R., 527 Custom House, Denver, Colorado....1926
Kamm, Mrs. Oliver, 365 Lake Shore Drive, Grosse Pointe Farms, Michigan....1934
Kearns, Lucy Pendleton, Lynnehaven P. O., Lynnehaven, Virginia....1935
Keller, L. Floyd, Zion National Park, Springdale, Utah....1934
Kellog, Dace C., Box 343, Norwalk, Ohio....1932
King, Fain W., Wickliffe, Kentucky....1934
Kingsbury, Elizabeth W., Hockaday School, Dallas, Texas....1933
Klepfer, Ward, Box 1031, Granville, Ohio....1934
Knapp, Elmer, R. R. No. 2, Troy, Pennsylvania....1930
Knappen, Phoebe, 2925 Tilden St., N. W., Washington, D. C....1926

Knight, Prof. Harry H., Dept. Zoology and Entomology, Iowa State College, Ames, Iowa....1926
Krug, Carl B., % George Krug, Minonk, Illinois....1930
Kubichek, W. F., 164 19th St., Cedar Rapids, Iowa....1926
Kummerlowe, Dr. Hans, Cichorius Strasse 6 III, Leipzig, Germany....1931
Langelier, Gus, R. R. 1, Frubourg St. Jean Baptiste, Quebec, Ontario....1933
Lawrence, A. G., City Health Dept., Winnipeg, Manitoba....1928
Lee, Addie, 2111 Dixie Place, Nashville, Tennessee....1933
Leedy, Charles A., % The Telegram, Youngstown, Ohio....1927
Lewis, Merriam G., Langhorne Place, Salem, Virginia....1930
Lincoln, Frederick C., Bureau Biological Survey, Washington, D. C....1914
Linsdale, Dr. Jean M., Museum of Vertebrate Zoology, University of California, Berkeley, California....1928
Lloyd, C. K., 11 Elm St., Oxford, Ohio....1925
Lloyd, Hoyes, 582 Mariposa Ave., Rockcliffe Park, Ottawa, Ontario....1922
Lodge, William R., Silver Lake Blvd., R. D. 1, Cuyahoga Falls, Ohio....1935
Lomax, Dr. Claude C., Dale, Indiana....1921
Long, Charles F., 203 E. Broad St., Columbus, Ohio....1934
Long, Mary A., 526 E. First St., Royal Oak, Michigan....1932
Long, William H. Jr., 1612 Morton Ave., Ann Arbor, Michigan....1933
Lovell, Mrs. Ray, 101 N. Monroe Ave., Columbus, Ohio....1932
Low, Seth H., 50 Glendale Road, Quincy, Massachusetts....1931
Lubin, S. F., 106 Chapin St., Binghamton, New York....1934
Lumley, Ellsworth, High School, Great Falls, Montana....1935
Lundquist, Arthur, Peabody Hospital, Webster, South Dakota....1930
MacLoughlin, Mrs. F. E., 43 Inglewood Drive, Hamilton, Ontario....1928
MacLulick, D. A., Rayol Ontario Museum of Zoology, Toronto, Ontario....1933
Marburger, Clifford, Denver, Lancaster Co., Pennsylvania....1924
Marden, Aaron, Eagle Island, S. Harpswell, Maine....1933
Marsh, V. L., Box 597, Great Falls, Montana....1934
Marshall, Raymond O., Box 72, R. D. 1, Leetonia, Ohio....1930
Maslowski, Karl H., 950 Glenwood Ave., Cincinnati, Ohio....1934
Mayr, Dr. Ernst, American Museum of Natural History, New York City....1933
McCall, Mrs. Irene S., 2716 19th St., Racine, Wisconsin....1934
McCarthy, T. J., 1524 Hughitt Ave., Superior, Wisconsin....1935
McGill, Dr. J. T., Vanderbilt University, Nashville, Tennessee....1930
McIntosh, Duncan, Fairhope, Alabama....1931
McLaughlin, Vincent, 1813 Kensington Ave., Youngstown, Ohio....1935
McNeil, Dr. Charles A., 111 W. Fourth Ave., Sedalia, Missouri....1914
McNutt, Dorothea R., Greensboro, North Carolina....1935
Meltreat, Burton W., Paullina, Iowa....1930
Melzer, James P., Milford, New Hampshire....1931
Mendenhall, Eugene W., 97 Brighton Road, Columbus, Ohio....1932
Meyer, Miss Adelphia, 2016 Belmont Blvd., Nashville, Tennessee....1931
Michener, Harold, 418 N. Hudson Ave., Pasadena, California....1926
Miller, Alden H., Museum Vertebrate Zoology, Berkeley, California....1930
Miller, Empey, Freeland, Michigan....1931
Miller, Henry C., 9 Sheridan Drive, Monroe, Michigan....1933
Miller, J. Paul, Box 51, Mill Village, New Hampshire....1931
Miller, Miss Louise J., 2708 Elizabeth Ave., Zion, Illinois....1929
Million, A., 2060 Rustic Road, Dayton, Ohio....1931
Mills, Daisy, Woodside, New Brunswick....1934
Moffit, James, 1879 Broadway, San Francisco, California....1931
Molloy, Mrs. R. B., 418 W. Third Ave., Corsicana, Texas....1930
Monroe, Burt, 110 S. 5th St., Louisville, Kentucky....1935
Monson, Gale, Box 432, Safford, Arizona....1933
Moore, Miss Dora, 60 E. Mulberry St., Athens, Ohio....1934
Moreland, G. E., 219 Eastern Ave., Greenville, Illinois....1934
Morse, Frank E., Boston Bird Book Co., 162 Boylston St., Boston, Mass....1926
Mounts, Mrs. Beryl Taylor, Ballard Normal School, Macon, Georgia....1923
Mousley, William H., 4073 Tupper St., Westmount, Montreal, Quebec....1922
Mulaik, Dorthea Upp, Box 155, Edinburgh, Texas....1933

Munter, Capt. W. H., U. S. Coast Guard, 209 Federal Bldg., Jacksonville, Florida....1933
Murie, Adolph, 328 Hilgard Hall, Berkeley, California....1932
Murie, O. J., Jackson, Wyoming....1934
Murray, Rev. J. J., Lexington Presbyterian Church, Lexington, Virginia....1931
Myrus, A. A., 81 Ford Ave., Oneonta, New York....1934
Naeser, Charles P., 515 Bash Court, Champaign, Illinois....1932
Nagel, Weaner Otto, Butler Apts., Columbia, Missouri....1933
Nelson, Arnold L., Food Habits, U. S. Biological Survey, Washington, D. C....1932
Nelson, Miss Viola, 35 W. Washington, Athens, Ohio....1935
Nicholson, Donald J., 534 S. Eola Drive, Orlando, Florida....1927
Norton, Arthur H., 22 Elm St., Portland, Maine....1934
Oakes, Mervin E., State Normal School, Fredonia, New York....1933
Odum, Eugene, Box 792, Chapel Hill, North Carolina....1930
O'Keefe, Mrs. Ethel, Glenarm, Illinois....1932
Oliver, Mary C., 909 Santa Rita St., Silver City, New Mexico....1934
Ortman, Mrs. Enid D., 4660 South Franklin, Englewood, Colorado....1930
Overing, Robert, Landover, Maryland....1930
Owre, Oscar, Jr., 2625 Newton Ave., South, Minneapolis, Minnesota....1935
Palmer, Miss Mary C., 760 Midlothian Blvd., R. D. 2, Youngstown, Ohio....1927
Palmer, Ralph S., Route 1, Brunswick, Maine....1934
Palsson, William F., Halldorsstadir, Laxardal, via Husavik, Iceland....1931
Patrick, Dr. Leon Patrick, Smith-Grote Bldg., Orange, California....1931
Patterson, J. E., 341 Giannini Hall, Berkeley, California....1930
Peabody, Rev. P. B., Box 55a, R. D. 6, Star Prairie, Wisconsin....1930
Peasley, Mrs. Harold, 1807 6th Ave., Des Moines, Iowa....1934
Pellew, Miss Marion, Box 455, Aiken, South Carolina....1920
Pennell, Miss Edna, 503 N. Main St., Mount Vernon, Ohio....1931
Pepper, William, Jr., 110 Glenview Ave., Wyncote, Pennsylvania....1932
Perin, Miss Kate P., Withrow High School, Cincinnati, Ohio....1931
Perry, Harold E., 1329 Ethel St., Glendale, California....1932
Peters, A. S., 529 Hickory St., Mankato, Minnesota....1933
Peterson, Alfred, Lock Box 211, Pipestone, Minnesota....1931
Peterson, N. Theodore, 80 Oaklawn Ave., Battle Creek, Michigan....1931
Pickens, A. L., 4029 Life Science Bldg., University of California, Berkeley, California....1927
Pierce, Fred J., Winthrop, Iowa....1920
Pierce, John T., Anita, Iowa....1930
Pierce, Wright M., Box 343, Claremont, California....1926
Pirnie, Dr. Miles D., W. K. Kellogg Bird Sanctuary, Augusta, Michigan....1928
Poenitz, Hans, Frankfurter Strasse 2, III, Leipzig, Germany....1930
Poland, Lloyd, 526 W. Burke St., Martinsburg, West Virginia....1934
Potter, Julian K., 437 Park Ave., Collingswood, New Jersey....1915
Pratt, D. R., McKinley High School, Canton, Ohio....1932
Presnall, Mrs. Clifford C., Springdale, Utah....1930
Price, John B., 532 Alvarado, Stanford University, California....1931
Quattlebaum, W. D., 1925 Paloma St., Pasadena, California....1930
Rahe, Carl W., 4666 Turney Road, Cleveland, Ohio....1931
Ramsden, Charles Theodore, Apartado 146, Guantanamo, Cuba....1914
Rapp, F. W., Vicksburg, Michigan....1926
Ray, Edward M., Fordsville, Kentucky....1935
Raz, George F., Box 83, Union Pier, Michigan....1933
Reeder, J. T., 318 College Ave., Houghton, Michigan....1926
Reeder, John P., 502 Seldon Road, Iron River, Michigan....1934
Reis, C. O., 646 Juanita Drive, Los Angeles, California....1931
Rice, Mrs. Bird Wells, 1035 S. Miller St., Cyanthiana, Kentucky....1935
Rich, Dr. Guy C., 1820 El Cerrito Place, Hollywood, California....1914
Richardson, Hubert, 182 Rusholme Road, Toronto, Ontario....1931
Ricks, Jesse J., 30 East 42nd St., New York City....1931
Ritter, John H., 1015 Old Orchard Ave., Dayton, Ohio....1932
Roasch, Gilbert O., Science Hall, University of Wisconsin, Madison, Wisc....1931
Roberts, Dr. Francis L. R., 419½ S. Governor St., Iowa City, Iowa....1924

Roby, Mrs. John W., Lima, Ohio....1935
Rollert, Judson, 1234 Chicago Ave., Evanston, Illinois....1933
Rosewall, Prof. O. W., Dept. of Zoology, Louisiana State University, Baton Rouge, Louisiana....1931
Ross, Hollis T., 109 S. 3rd St., Lewisburg, Pennsylvania....1933
Ross, Miss Julia E., Box 82, Kimball, Minnesota....1920
Rottenstein, Vilma, 2907 Scottwood Ave., Toledo, Ohio....1931
Russell, Henry N. Sr., 19 Alexander St., Princeton, New Jersey....1932
Sanders, R. D., U. S. Forest Service, Rhinelander, Wisconsin....1935
Sargent, William D., Entomology Dept., Cornell University, Ithaca, New York..1931
Sattire, A. M., Concordia College, Moorhead, Minnesota....1934
Saunders, Aretas A., 48 Longview Ave., Fairfield, Connecticut....1934
Saunders, George B., Staff Ornithologist, Game Division, Dept. of Conservation, Lansing, Michigan....1926
Schafer, John J., Port Byron, Illinois....1926
Schaller, R. A., 124 S. College Drive, Bowling Green, Ohio....1930
Schneider, Miss Evelyn, 227 Alta Ave., Louisville, Kentucky....1935
Schultz, G. J., Sutherland, Iowa....1934
Schultz, Miss Helen, Box 105 State Normal College, Fredericksburg, Va....1929
Sedgwick, Leibert D., I. S. and S. C. Home, Knightstown, Indiana....1935
Selter, Vivian, P. O. Box 21, St. Petersburg, Florida....1934
Shadle, Prof. Albert R., Biology Dept. University of Buffalo, Buffalo, N. Y....1930
Schaftesbury, Prof. Archie D., N. C. C. W., Greensboro, North Carolina....1930
Shaw, Mrs. Elizabeth M., 2417 Rosewood Ave., Richmond, Virginia....1931
Sheppard, R. W., 1805 Mouland Ave., Niagara Falls, Ontario....1933
Shields, T. H., 150 18th St., Warwood, Wheeling, West Virginia....1934
Shipman, Charles W., 114 Ridge Road, Willoughby, Ohio....1930
Shirling, Prof. A. E., 3849 E. 62nd St., Kansas City, Missouri....1924
Shoop, Cora E., Steelville, Missouri....1935
Sibley, John E., R. D. 2, Whittemore, Michigan....1933
Sibley, Norman O., R. D. 2, Whittemore, Michigan....1933
Skaggs, Merit B., 15973 Euclid Ave., E. Cleveland, Ohio....1934
Slack, Mabel, 1004 Everett Ave., Louisville, Kentucky....1934
Smith, Dr. A. F., Manning, Iowa....1934
Smith, Mrs. Florence L., Cincinnatus, New York....1935
Smith, Herbert Allyn, 3219 Bellefontaine, Kansas City, Missouri....1932
Smith, Lewis MacCuen, 8018 Winston Rd., Chestnut Hill, Philadelphia, Pa...1931
Smith, Napier, % Credito Balear, Palma de Mallorca, Balearic Islands, Spain....1928
Smith, Wendell Phillips, Wells River, Vermont....1921
Smyth, J. Adger, Salem, Virginia....1933
Smyth, Dr. L. C. R., 10819 Clifton Blvd., Cleveland, Ohio....1935
Snow, K. C., Route 1, Dexter, New Mexico....1932
Snyder, L. L., Royal Ontario Museum of Zoology, Bloor St. and Avenue Road, Toronto 5, Ontario....1929
Spawn, Gerald B., Dept. of Zoology, Iowa State College, Ames, Iowa....1934
Speirs, J. Murray, 17 Wolfrey Ave., Toronto 6, Ontario....1931
Sperry, Charles C., Biological Survey, Denver, Colorado....1931
Starrett, William C., 303 Maryland Ave., Peoria, Illinois....1933
Sterry, Elizabeth, Teacher's College, San Marcos, Texas....1930
Stevens, O. A., State College Station, Fargo, North Dakota....1926
Stevens, Ross O., Soil Conservation Service, Coon Valley, Wisconsin....1934
Stein, Hilda A., Southern Illinois State Teacher's College, Carbondale, Ill....1933
Stein, Stanley F., Shakopee, Minnesota....1932
Stephens, Mrs. A. B., 1695 Filbert St., San Francisco, California....1935
Stevenson, James, National Park Service, Oklahoma City, Oklahoma....1931
Stewart, Paul A., Leetonia, Ohio....1925
Stiles, Bruce F., 3726 7th Ave., Sioux City, Iowa....1935
Stillwell, W. H., Mt. Vernon, Ohio....1934
Stine, Perna M., State Teacher's College, Minot, North Dakota....1931
Stoner, Emerson A., Box 144, Benicia, California....1934

Stooksberry, C. L., 1814 South Miller Ave., Alliance, Ohio....1931
Stophlet, John J., 2612 Maplewood Ave., Toledo, Ohio....1934
Storer, Dr. Tracy I., Div. of Zoology, University Farm, Davis, California....1928
Strickland, Miss Laura Raymond, 578 E. Central St., Franklin, Mass....1935
Stroley, Miss Elsie A., Morristown, New Jersey....1935
Stuart, Mrs. Margaret J., Box 546, Wheaton, Illinois....1933
Stump, Jack, 1014 Price Rd., Clayton, Missouri....1934
Sturgeon, Myron, 259 W. 2nd St., Salem, Ohio....1934
Sullivan, Walter F., 351 Turk St., San Francisco, California....1925
Sumner, E. L., Box 188, Menlo Park, California....1931
Sumner, E. L. Jr., Box 188, Menlo Park, California....1929
Swanson, Gustav, 3305 47th Ave. South, Minneapolis, Minnesota....1927
Swedenborg, Ernie D., 4905 Vincent Ave., South, Minneapolis, Minnesota....1929
Swenk, Mrs. Myron H., 1410 N. 37th St., Lincoln, Nebraska....1925
Tanner, Orey, 5019 Constance St., New Orleans, Louisiana....1933
Taverner, P. E., National Museum of Canada, Ottawa, Ontario, Canada....1925
Teachenor, Dix, 1020 West 61st St., Kansas City, Missouri....1923
Test, Dr. Frederick H., 511 Russell St., West Lafayette, Indiana....1931
Thomas, Otho S., 205 S. Greene St., Rock Rapids, Iowa....1932
Thompson, Paul A., Northville, South Dakota....1934
Thorp, George B., Carnegie Institute of Technology, Pittsburgh, Pa....1935
Tompkins, Ivan R., U. S. Dredge Morgan, Savannah, Georgia....1931
Townsend, James E. Jr., R. D., Brookings, South Dakota....1935
Trautman, Milton B., Museum of Zoology, Ann Arbor, Michigan....1932
Travis, Bernard V., Iowa State College, Ames, Iowa....1935
Trempe, A. E., 612 Kimball St., Sault Ste. Marie, Michigan....1932
Trimble, Ruth, Carnegie Museum, Pittsburgh, Pennsylvania....1935
Tubbs, Farley F., 924 Cleo St., Lansing, Michigan....1935
Turtle, Lancelot J., Rosemount Khock, Belfast, Ireland....1930
Tuttle, Henry C., 50 State St., Boston, Massachusetts....1930
Tyler, B. T., 215 W. Uraka Ave., Johnson City, Tennessee....1934
Uhler, Francis M., U. S. Biological Survey, Washington, D. C....1931
Upton, Clyde, 41 Acosta Ave., Elm Grove, West Virginia....1934
Ussher, R. D., Nancy Lake Farm, King, Ontario....1934
Van Deusen, H. M., 406 Parker St., Newark, New Jersey....1934
Varner, L. S., McMillan, Michigan....1934
Vasicek, J. M., 10605 Lamontier Ave., Cleveland, Ohio....1934
Vetter, Dr. Charles, Grand View, Nyack, New York....1931
Vincent, Roch Arthur, 517 St. Lawrence Blvd., Montreal, Quebec....1931
Wachter, William, Hotel Martin, Sioux City, Iowa....1934
Wagner, Miss Elizabeth E., 11 8th Ave., Danbury, Connecticut....1932
Walker, W. M. Jr., 1638 White Ave., Knoxville, Tennessee....1925
Walkinshaw, Dr. Lawrence M., 1421 W. Michigan Ave., Battle Creek, Mich....1928
Wanamaker, Paul, 443 Seminole St., Oradell, New Jersey....1934
Watkins, Allen G., U. S. Forest Service, Saucier, Mississippi....1934
Ward, Lawrence, St. Johns, R. D. 1, Michigan....1934
Watson, Lucius Howard, 4103 Sheridan Blvd., Lincoln, Nebraska....1922
Watterson, William H., 14315 Milverton Road, Cleveland, Ohio....1929
Webster, E. H., Fairhope, Alabama....1932
Wells, William, Colony, Kansas....1934
Welshimer, A. G., Urbana, Ohio....1934
Welter, Wilfred A., Teacher's College, Moorhead, Kentucky....1934
West, Joe Young, Virginia State Teacher's College, East Radford, Virginia....1931
Wetherbee, Mrs. Kenneth B., 11 Dallas St., Worcester, Massachusetts....1930
Weyl, Edward Stern, 6506 Lincoln Drive, Mt. Airy, Philadelphia, Pa....1927
Whitaker, Inness, Hotel Robert Fulton, 228 W. 71st St., New York City....1930
Whitten, Easton W., Coffeen, Illinois....1930
Whittle, Charles L., River Crossroads, Peterboro, New Hampshire....1931
Wilkinson, Alexander Stanley, Kapiti Island, Wellington, New Zealand....1930
Williams, Laidlaw O., Box 453, Carmel, California....1930
Williams, Noel J., Milford, Iowa....1918

Williams, Robert W., U. S. Biological Survey, Washington, D. C.....1926
Willis, Warren J., 24824 89th Ave., Belle Rose, Long Island, New York.....1928
Wilkins, W. N., Chapman, Kansas.....1934
Wilson, Miss Belle, 5920 Goodwin Ave., Dallas, Texas.....1928
Wilson, Sue, 1010 First National Bank Bldg., Omaha, Nebraska.....1931
Witschi, Dr. Emil, Dept. Zoology, S. U. I., Iowa City, Iowa.....1935
Wolfe, John N., 205 N. Warren Ave., Columbus, Ohio.....1933
Wolfe, Capt. L. R., 1819 W. Pershing Road, Chicago, Illinois.....1934
Wolfram, George S., Canal Winchester, Ohio.....1932
Wood, Dr. Casey A., E. W. S. Library, McGill University, Montreal, Quebec..1924
Wood, Dr. Harold B., 3016 N. Second St., Harrisburg, Pennsylvania.....1932
Wood, Mary Adele, Gates Hall, University of Chicago, Chicago, Illinois.....1930
Wood, Norman A., Museum of Zoology, University of Michigan, Ann Arbor, Michigan.....1925
Woods, W. C. Stephen, Minnesota.....1934
Woodhull, Dr. Maurice W., Cottonwood Falls, Kansas.....1931
Woolman, Edward, Box 128, Haverford, Pennsylvania.....1928
Work, Mrs. Mary Robert, Bosky Acres, Barrington, Illinois.....1934
Worthley, W. F., Chicago Academy of Sciences, Lincoln Park, Chicago, Ill.....1930
Yeatter, R. E., Ill. Nat. History Survey, Nat. His. Bldg., Urbana, Illinois.....1932
Youngworth, William, 3119 E. 2nd St., Sioux City, Iowa.....1934
Yunker, Emilie, 1140 Everett Ave., Louisville, Kentucky.....1935
Zimmerman, Fred R., 1105 W. Johnson St., Madison, Wisconsin.....1935
Zeigler, C. W., Murray City, Ohio.....1934
Zurcher, Miss Olga, 133 S. Richardson Ave., Columbus, Ohio.....1933